STAFF REPORT

Meeting Date: November 1, 2016

To: Honorable Mayor & City Council

From: Aaron Kunz, Deputy Director of Transportation

Subject: Consideration of Fehr & Peers Recommendations for Crosswalk Treatments

Attachments:
1. Beverly Gardens Park Renderings
2. Fehr & Peers Memorandum – Pedestrian Crossing Evaluation

INTRODUCTION

This report provides a status of the evaluation of crosswalks in several areas of the City and proposed next steps.

DISCUSSION

The City has received several requests to evaluate existing marked crosswalks and to add new marked crosswalks in several areas of the City. In response, *Fehr & Peers*, the City's on-call transportation engineering firm, has conducted an evaluation and best practice options of crosswalk treatments as outlined below.

BEVERLY GARDENS PARK DECOMPOSED GRANITE (DG) PATH:

For the majority of blocks in Beverly Gardens Park, the DG path runs parallel to Santa Monica or Wilshire Boulevard and there are no crosswalks or curb ramps along the path at the intersecting streets. Sidewalks and curb ramps are at the corner of Santa Monica or Wilshire Boulevards.

The bid specifications for the North Santa Monica Boulevard Reconstruction Project include reconstructing the curb ramps and sidewalks at the existing locations. The initial conceptual design for renovating Beverly Gardens Park, prepared by *Mia Lehrer & Associates*, includes a new path connecting to the street corners, with landscaping/hedges along the park way to discourage pedestrians from crossing mid-block.

In addition to requests from community members to evaluate mid-block crossings along Beverly Gardens Park, a complaint of discrimination against the City of Beverly Hills has been filed stating that the City does not provide curb ramps on intersecting streets along

the decomposed granite pedestrian path between Crescent and Doheny Drives. The Caltrans ADA Program is investigating the complaint on behalf of the Federal Highway Administration (FHWA). Upon completion of the investigation, Caltrans/FHWA will issue a findings report. Any additions, changes or alterations to curb ramps and crosswalks are required to be constructed to current accessibility standards.

The *Fehr & Peers* report outlines best practice options for mid-block crosswalk treatments along Beverly Gardens Park DG path in two categories:

- For streets with stop signs at Santa Monica or Wilshire Boulevards
  1. Raised continental crosswalks (this creates a speed table that also serves as a traffic calming device)
  2. Fluorescent yellow-green pedestrian signage
  3. Remove sidewalk connecting to Santa Monica or Wilshire Boulevards
  4. Remove curb ramps at Santa Monica or Wilshire Boulevards (raised continental crosswalk would replace need for curb ramp).

- For streets with traffic signals at Santa Monica or Wilshire Boulevards
  - Provide connection from DG path to street corners
  - Remove/block mid-block crossings.

Preliminary budget estimates for the crosswalk treatments as recommended by Fehr & Peers exceed $1.3 million, including cost of raised crosswalks, sidewalk and ramp demolition, new curb and gutters, additional landscaping with irrigation and drainage. Staff recommends acquiring detailed cost estimates and conducting additional public outreach should the City Council decide to include this option as part of the North Santa Monica Boulevard Reconstruction project. Going forward with mid-block crossing would also have implications on the timeline for design of Beverly Gardens Park.

UNMARKED CROSSWALKS ALONG SOUTH SIDE ONLY OF PARK WAY ADJACENT TO BEVERLY GARDENS PARK

Evaluation and best practice options for crosswalk treatments along the south side only of Park Way at Crescent, Canon, Beverly, and Rodeo Drives.

- High visibility continental crosswalks with Pedestrian Hybrid signals (described on page 20 of the Fehr & Peers report) for Canon, Beverly and Rodeo Drives
- Construction of a bulb-out on the west side of Rodeo Drive
- Signage at Crescent Drive directing pedestrians to the signalized crosswalk at Santa Monica Boulevard. A crosswalk is not recommended at Crescent Drive due to low pedestrian volume.

A preliminary cost estimate is $175,000 per location (x3) for design and construction, plus an additional $25,000 for the bulb-out at Rodeo Drive.

SOUTH SANTA MONICA BOULEVARD AT LASKY DRIVE and WILSHIRE BOULEVARD AT PALM DRIVE

Assessment of the appropriateness of the existing marked crosswalk and provided best practice options on South Santa Monica and Wilshire Boulevards.

- South Santa Monica Boulevard/Lasky Drive. Immediate considerations include enhancing the existing crosswalk with high-visibility markings, upgraded fluorescent signage, and advance yield markings (i.e., triangular street markings known as "shark teeth") to alert motorist of safest place to stop when a pedestrian is in the crosswalk. Additional improvements requiring more time to design and implement include rectangular rapid flashing beacons, a raised median and curb ramp upgrades.

- Wilshire Boulevard/Palm Drive. Immediate considerations include replacing the existing high-visibility "ladder" crosswalk with a continental crosswalk, upgrading the existing pedestrian crossing signage with fluorescent signs in both directions, and installing the "shark teeth" yield markings. Additional improvements requiring more time to design and implement include rectangular rapid flashing beacons, two raised medians curb ramp upgrades, and a left-turn restriction. This crosswalk is included in the 2018-2020 Metro Call-for-Project grant funding cycle and includes a median island for pedestrian refuse, pedestrian activated flashers, reflective buttons on both sides of a continental crosswalk and illuminated signage.

A preliminary cost estimate for these two locations is roughly $125,000 each, including both design and construction.

ADDITIONAL SCHOOL AND CIVIC LOCATIONS

In addition, per the Fehr & Peers evaluation, City staff has installed "continental" cross bars at crosswalks at all Beverly Hills Unified School District schools and has ordered in-roadway pedestrian warning signs for the Rexford Drive intersection between City Hall and the Police Station/Library.

The Traffic & Parking Commission reviewed *Fehr & Peers* crosswalk recommendations in two parts: On July 7, 2016 they reviewed recommendations for "Continental Crosswalks" treatments at individual intersections, and Beverly Gardens at Park Way. On September 1, 2016, the Commission reviewed crosswalks treatments for the Beverly Gardens DG path. The Commission's comments and questions are highlighted in the Fehr & Peers report. A City Council/Traffic & Parking Commission Liaison Committee meeting is scheduled for October 31, 2016.

PUBLIC NOTICE

Public notices were mailed to 361 residential properties 500-ft north of the DG path between Whittier and Doheny Drives, the homes on Park Way between Rodeo and Crescent Drives, and the Beverly Hills Presbyterian Church

FISCAL IMPACT

Pending City Council direction, detailed construction drawings and cost estimates would be developed for crosswalk treatments outlined in the Fehr & Peers report. Funding is available in the Santa Monica Boulevard Reconstruction Project Capital Improvement Fund, CIP 889 for crosswalk treatments along the DG path and CIP 0367, Intersection Improvements, for other crosswalk treatments outlined in this report.

RECOMMENDATION

Staff seeks direction from the City Council regarding the Fehr & Peers report, including:

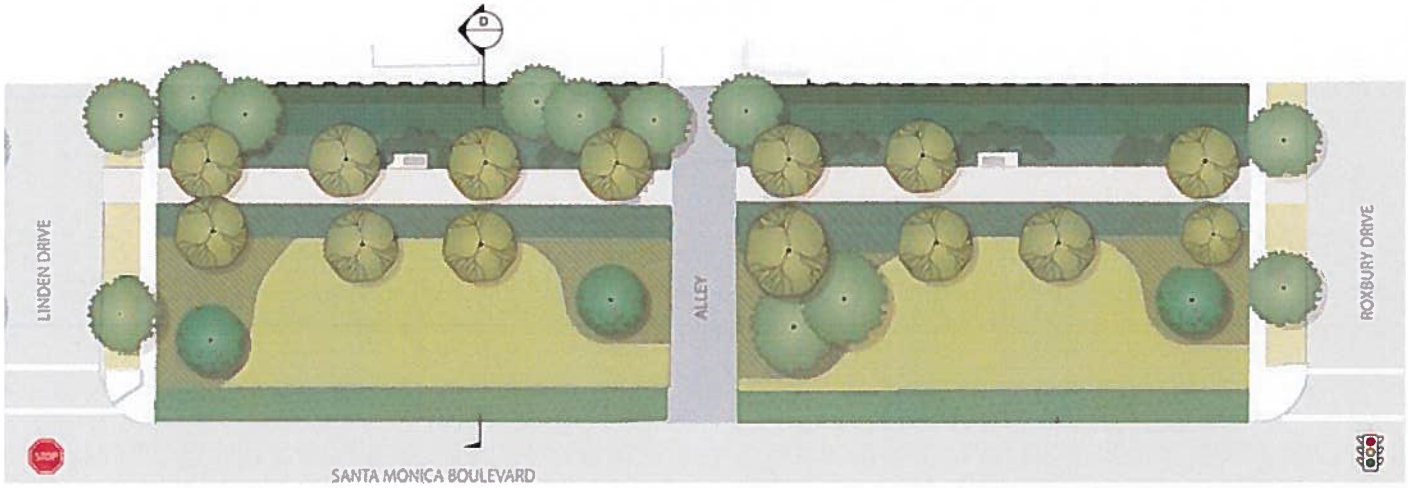
1. Further consideration of crosswalk treatments along the DG path
2. Construction of crosswalks on the south side of Park Way at Canon, Beverly and Rodeo Drives
3. Construction of modifications to the Wilshire/Palm and South Santa Monica Boulevard/Lasky crosswalks.

Susan Healy Keene
Community Development Director
Approved By

ATTACHMENT 1

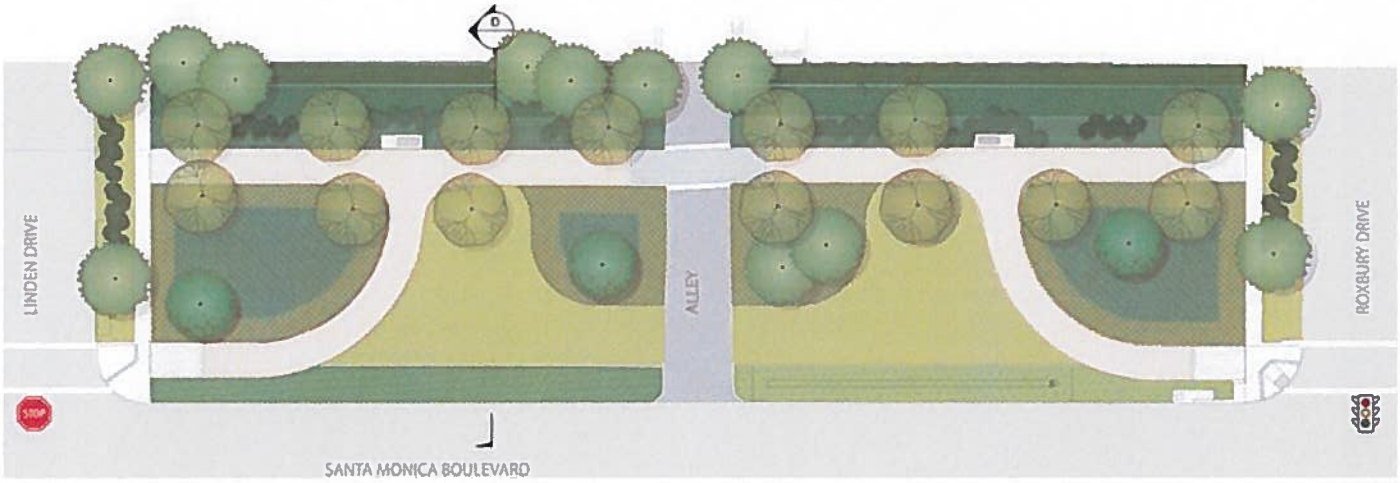
Intersections with Traffic Signals

Existing*

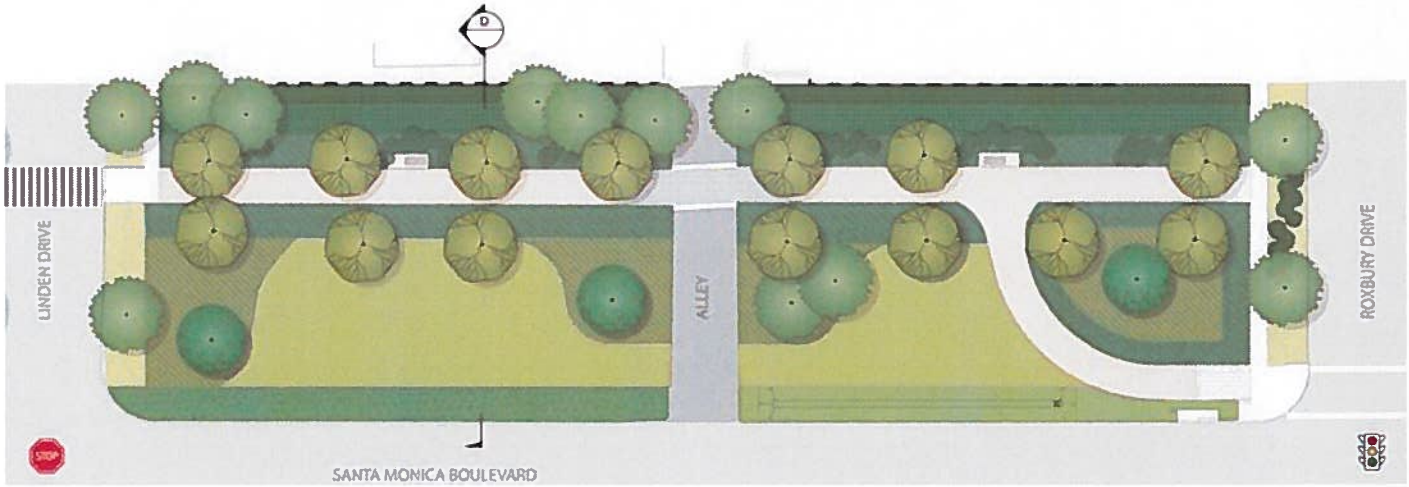


*Location of vegetation is approximate. Trees are not to scale.

Initial Design Proposed by Mia Lehrer & Associates

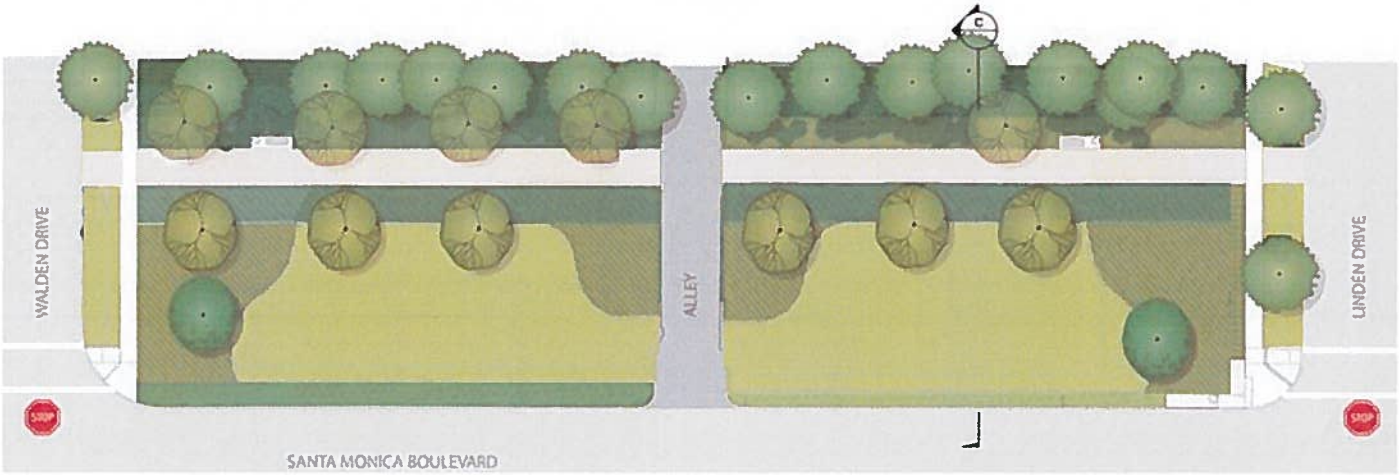


Alternate Design Incorporating Fehr & Peers Recommendations



Intersections with Stop Signs

Existing*



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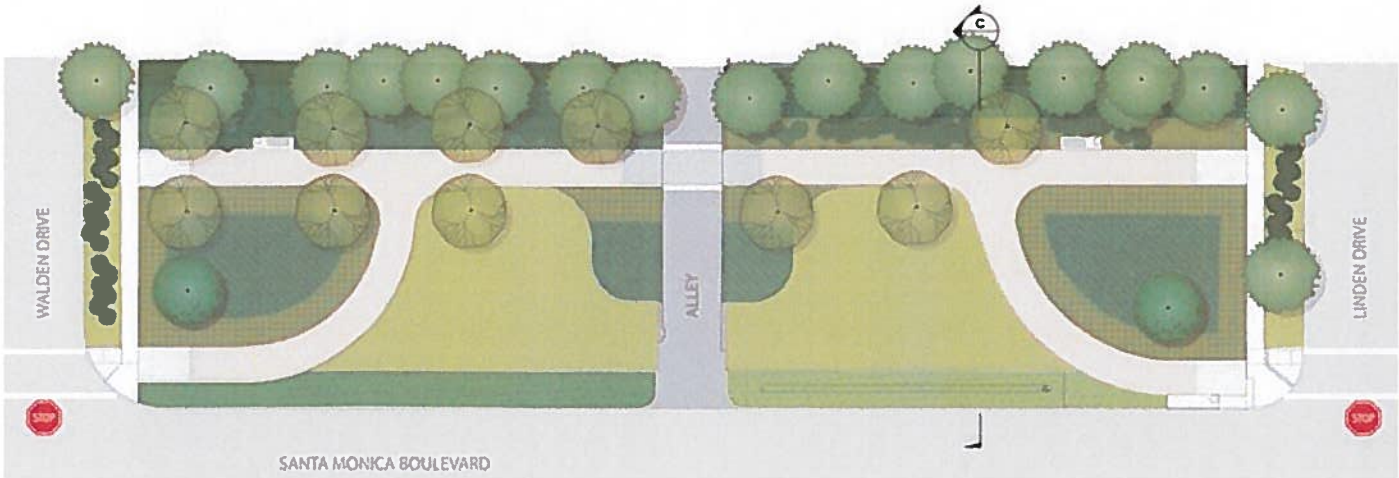
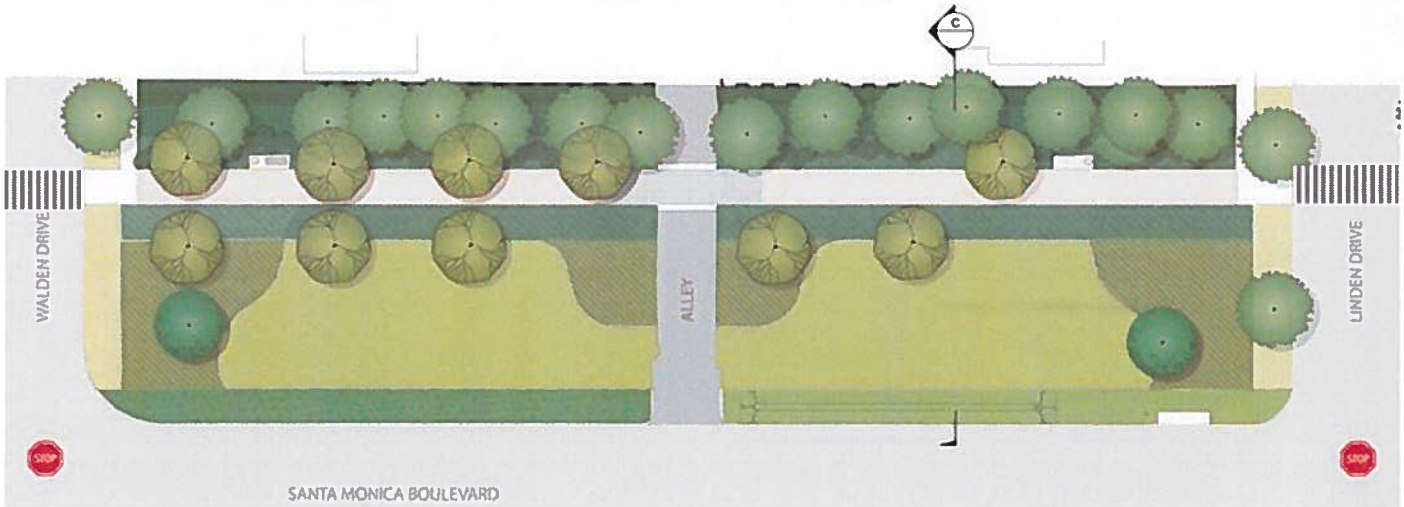


Alternate Design Incorporating Fehr & Peers Recommendations



ATTACHMENT 2

FEHR & PEERS

MEMORANDUM

Date: November 1, 2016

To: Aaron Kunz, City of Beverly Hills

From: Jaimee Bourgeois and Rachel Neumann

Subject: ***Pedestrian Crossing Evaluation***

Ref: LA15-2772

This technical memorandum summarizes the results of crosswalk treatment evaluations conducted for several existing marked and unmarked crossings and mid-block locations in the City of Beverly Hills. These locations include:

- the decomposed granite path through Beverly Gardens that intersects 28 streets;
- unmarked crosswalks along the south side of Park Way adjacent to Beverly Gardens Park at North Rodeo Drive, North Beverly Drive, North Canon Drive and North Crescent Drive;
- the north-south marked crosswalk across South Santa Monica Boulevard at the intersection with Lasky Drive;
- the north-south marked crosswalk across Wilshire Boulevard at the intersection with South Palm Drive; and
- the east-west stop-controlled crosswalks across North Rexford Drive in front of City Hall.

The crosswalk evaluations were undertaken to assess the appropriateness of existing or new crossing treatments given that these crossing locations are at unsignalized intersections along busy arterial streets or mid-block. All of the evaluations included at least one site visit and collection of traffic volumes, pedestrian peak hour volumes, and five-year pedestrian collision history, with the exception of North Rexford Drive which did not include data collection. For each location, we have identified best practice options for the City's consideration based on guidance provided in the California Manual on Uniform Traffic Control Devices, academic research, national best practices, professional experience, specific site conditions, and an internal crosswalk treatment identification tool developed by Fehr & Peers. The tool combines academic research on crosswalk treatment effectiveness with national best practices and has been peer-reviewed by members of the Institute of Transportation Engineer's Pedestrian and Bicycle Council executive committee. Specific roadway conditions considered include speed limit, pedestrian volumes, crossing distance, number of travel lanes, presence of bicyclists, presence of transit, presence of a median, presence of on-street parking, and expected motorist compliance.

Comments and questions from the Traffic and Parking Commissioners (7/7/2016 and 9/1/2016 meetings) have been incorporated into this document.

BEVERLY GARDENS DECOMPOSED GRANITE PATH

STUDY AREA

The study corridor is approximately 1.75 miles and includes the path that runs parallel to and north of Wilshire Boulevard from Whittier Drive to the Electric Fountain on the northwest corner of Wilshire Boulevard and Santa Monica Boulevard North and then continues east parallel to Santa Monica Boulevard North to Carmelita Avenue. The path is primarily decomposed granite with paved portions throughout. The majority of the path is set back from the road by approximately 60 feet with portions connecting to standard sidewalk facilities along Santa Monica Boulevard North and to secondary paths when the path runs through Beverly Gardens Park (three full blocks of park space between Rodeo Drive and Crescent Drive).

The path has 28 crossings including the intersections at the termini (Whittier Drive and Carmelita Avenue). Of these crossings, 5 are at narrow (approximately 20 feet wide) alleys, 13 are at roadways within close proximity to a stop-controlled intersection, and 10 are at roadways within close proximity to a signalized intersection. See Figure 1 for an overview of the study area. There are currently mid-block marked crosswalks where the path intersects Trenton Drive and Carmelita Avenue. There are no other mid-block marked crosswalks along the length of the path.

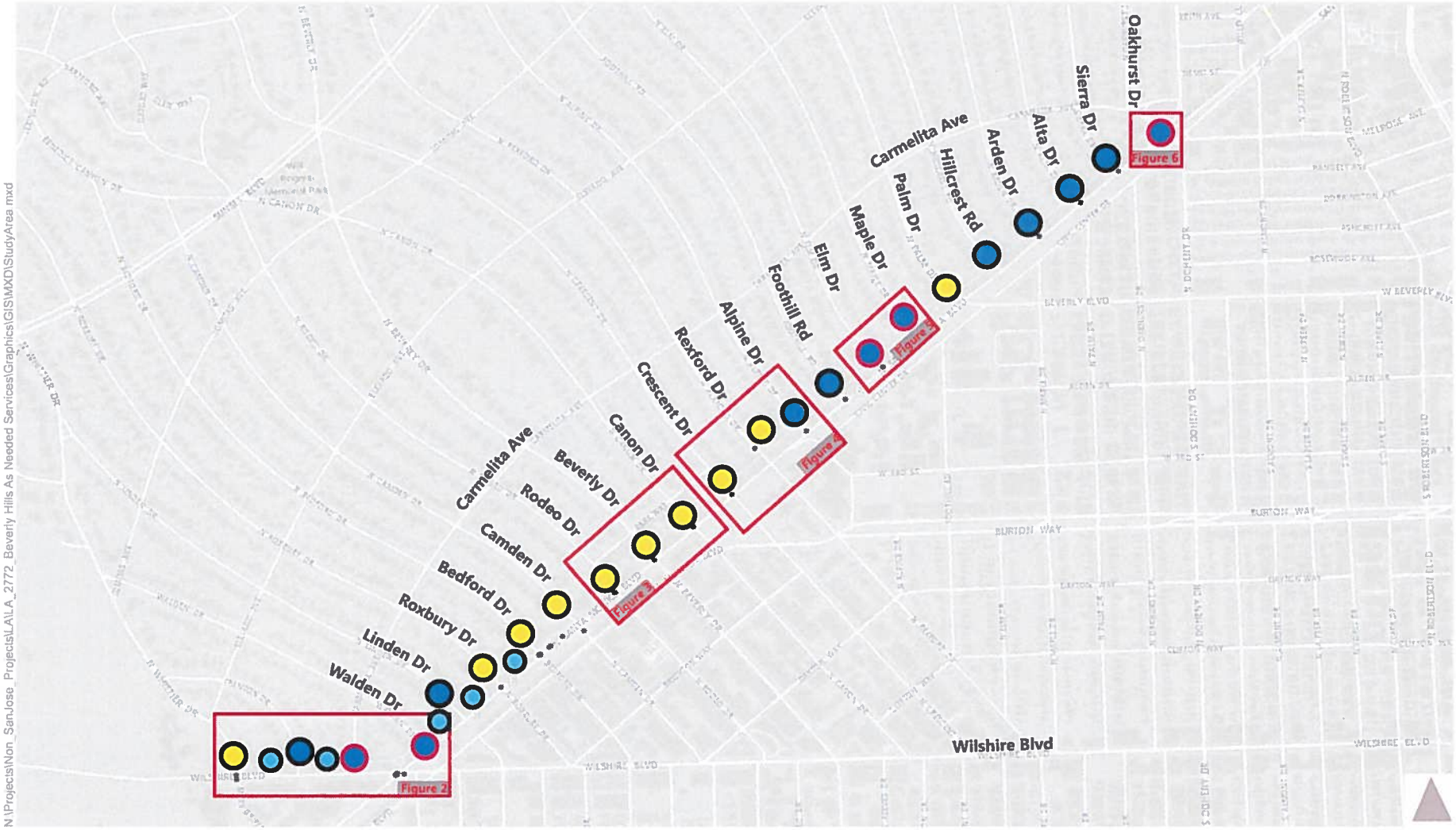
REVIEW OF KEY CROSSWALK SAFETY RESEARCH

Unless posted otherwise, pedestrians may legally cross at any intersection whether or not the crosswalk is marked. A marked or unmarked crosswalk serves as an extension of the sidewalk. At mid-block locations away from an intersection, markings must be in place to designate a legal crosswalk. At all legal crosswalks, motorists must yield the right-of-way to a pedestrian crossing, and pedestrians must use due care for their own safety. Outside of legal marked crosswalks or unmarked crosswalks at an intersection, pedestrians must yield the right-of-way to vehicles (California Vehicle Codes Sections 21950 and 21954).

Traffic engineers are frequently faced with the question of whether or not to mark a crosswalk. The California Manual on Uniform Traffic Control Devices Section 3B.18 states that crosswalk markings should not be installed indiscriminately at uncontrolled locations; rather, a traffic study should be conducted that considers factors such as the number of lanes, the distance from adjacent signalized intersections, the pedestrian volumes, the average daily traffic, the speed limit, and other appropriate factors. Furthermore, because mid-block crossings are unexpected by motorists, "they should be discouraged unless, in the opinion of the engineer, there is strong justification in favor of such installation."

To make an informed decision about whether to recommend crosswalk markings, it is helpful to review statistical safety analyses and industry recommendations regarding marked versus unmarked crossings.

To this day, traffic engineers reference a study conducted in 1972 that compared the incidence of pedestrian-related collisions at 400 intersections in San Diego with one marked crosswalk and one unmarked crosswalk (Herms, B., "Pedestrian Crosswalk Study: Crashes in Painted and Unpainted Crosswalks," Record No. 406, Transportation Research Board, Washington, DC, 1972). The study found that more collisions occurred at the marked crosswalks, even after taking into account the higher pedestrian volume at the marked crosswalks. The author concluded that the high crash rate may be attributable to the pedestrians' behavior and lack of caution when using a marked crosswalk, although this conclusion was not



Collision

Path Crossing Location Type

- Alley
- Adjacent to Stop Controlled Intersection
- Adjacent to Signalized Intersection

Includes Modifications to Standard Treatments Proposed

Figure 1
Study Area

supported by behavioral data. Following, the concept of "false sense of security" is often cited as the reason to not mark a crosswalk. This and other prior studies have been criticized for not taking into consideration different operational and physical characteristics at each location.

A study was released in 2005 that used regression models to compare 5-year crash records for 1,000 marked and 1,000 matched unmarked uncontrolled crossings, taking into consideration traffic volume, pedestrian exposure, number of lanes, median type, speed limit and other site variables (Zegeer, C., Stewart, J., and Huang, H., Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines, Federal Highway Administration Publication HRT-04-100, September 2005, www.fhwa.dot.gov/publications/research/safety/04100/04100.pdf).

The statistical findings can be summarized as follows:

- The crash rates are no different on two-lane and low-volume multi-lane roads.
- On multi-lane roads with daily traffic volumes above 12,000, a marked crosswalk alone (without other enhancements) was associated with a higher pedestrian crash rate.

The final recommendations for where crosswalks markings should be considered included:

1. At controlled intersections;
2. At uncontrolled intersections within school zones, with consideration of adult crossing guards and signs and markings for enhancement; and
3. At uncontrolled locations where engineering judgement dictates that the physical and operational characteristics would make the use of a crosswalk desirable for pedestrian mobility and safety.

Specifically at uncontrolled locations, the study concludes based on the statistical findings that marked crosswalks alone (without other enhancements) should not be used where speeds exceed 40 mph or on roadways with four or more lanes and a daily volume in excess of 12,000 vehicles without a raised median or 15,000 vehicles with a raised median. Other enhancements may include raised medians, curb extensions, traffic signal if warranted, traffic calming measures, lighting, removal of visibility restrictions, and warning signs/markings and beacons. The final recommendations are best summarized in Figure 2, which contains a table published in the report. A key point to acknowledge is that while marked crosswalks do not improve pedestrian safety, they should not simply be avoided because of concern that safety will decrease.

CORRIDOR EVALUATION

The corridor evaluation included several site visits, Saturday peak period pedestrian and bicycle counts, Saturday daily vehicular volumes, and a five-year pedestrian and bicycle collision review. The appropriateness of installing marked crosswalks at each of the decomposed granite trail crossing locations was then evaluated. A summary of the collected volumes is provided on Figure 3.

The trail crossings have been categorized and evaluated based on whether they intersect an alley, a roadway adjacent to a stop-controlled intersection or a roadway adjacent to a signal-controlled intersection. Each category and the associated evaluation methodology and results are discussed in more detail below.

Figure 2. Recommendations Contained in 2005 Zegeer Report

Table 11. Recommendations for installing marked crosswalks and other needed pedestrian improvements at uncontrolled locations.*

Roadway Type (Number of Travel Lanes and Median Type)	Vehicle ADT ≤ 9,000			Vehicle ADT >9,000 to 12,000			Vehicle ADT >12,000–15,000			Vehicle ADT > 15,000		
	Speed Limit**											
	≤ 48.3 km/h (30 mi/h)	56.4 km/h (35 mi/h)	64.4 km/h (40 mi/h)	≤ 48.3 km/h (30 mi/h)	56.4 km/h (35 mi/h)	64.4 km/h (40 mi/h)	≤ 48.3 km/h (30 mi/h)	56.4 km/h (35 mi/h)	64.4 km/h (40 mi/h)	≤ 48.3 km/h (30 mi/h)	56.4 km/h (35 mi/h)	64.4 km/h (40 mi/h)
Two lanes	C	C	P	C	C	P	C	C	N	C	P	N
Three lanes	C	C	P	C	P	P	P	P	N	P	N	N
Multilane (four or more lanes) with raised median***	C	C	P	C	P	N	P	P	N	N	N	N
Multilane (four or more lanes) without raised median	C	P	N	P	P	N	N	N	N	N	N	N

* These guidelines include intersection and midblock locations with no traffic signals or stop signs on the approach to the crossing. They do not apply to school crossings. A two-way center turn lane is not considered a median. Crosswalks should not be installed at locations that could present an increased safety risk to pedestrians, such as where there is poor sight distance, complex or confusing designs, a substantial volume of heavy trucks, or other dangers, without first providing adequate design features and/or traffic control devices. Adding crosswalks alone will not make crossings safer, nor will they necessarily result in more vehicles stopping for pedestrians. Whether or not marked crosswalks are installed, it is important to consider other pedestrian facility enhancements (e.g., raised median, traffic signal, roadway narrowing, enhanced overhead lighting, traffic-calming measures, curb extensions), as needed, to improve the safety of the crossing. These are general recommendations; good engineering judgment should be used in individual cases for deciding where to install crosswalks.

** Where the speed limit exceeds 64.4 km/h (40 mi/h), marked crosswalks alone should not be used at unsignalized locations.

*** The raised median or crossing island must be at least 1.2 m (4 ft) wide and 1.8 m (6 ft) long to serve adequately as a refuge area for pedestrians, in accordance with MUTCD and American Association of State Highway and Transportation Officials (AASHTO) guidelines.

C = Candidate sites for marked crosswalks. Marked crosswalks must be installed carefully and selectively. Before installing new marked crosswalks, an engineering study is needed to determine whether the location is suitable for a marked crosswalk. For an engineering study, a site review may be sufficient at some locations, while a more indepth study of pedestrian volume, vehicle speed, sight distance, vehicle mix, and other factors may be needed at other sites. It is recommended that a minimum utilization of 20 pedestrian crossings per peak hour (or 15 or more elderly and/or child pedestrians) be confirmed at a location before placing a high priority on the installation of a marked crosswalk alone.

P = Possible increase in pedestrian crash risk may occur if crosswalks are added without other pedestrian facility enhancements. These locations should be closely monitored and enhanced with other pedestrian crossing improvements, if necessary, before adding a marked crosswalk.

N = Marked crosswalks alone are insufficient, since pedestrian crash risk may be increased by providing marked crosswalks alone. Consider using other treatments, such as traffic-calming treatments, traffic signals with pedestrian signals where warranted, or other substantial crossing improvement to improve crossing safety for pedestrians.

Alley Crossings

There are five alley crossings along the corridor that are each approximately 20 feet wide. The alleys provide access to residential garages and garbage bins for trash collection services. As shown on Figure 1, the five alley locations (shown with a light blue circle) are:

- Between Whittier Drive and Trenton Drive north of Wilshire Boulevard
- Between Trenton Drive and Carmelita Ave north of Wilshire Boulevard
- Between Walden Drive and Linden Drive north of Santa Monica Boulevard
- Between Linden Drive and Roxbury Drive north of Santa Monica Boulevard
- Between Roxbury Drive and Bedford Drive north of Santa Monica Boulevard

<u>Existing Conditions and Collision Analysis</u>

At the alley crossings, there are no existing signage or pavement markings indicating the presence of a pedestrian crossing to vehicles. The sight distance for southbound vehicles approaching Wilshire Boulevard or Santa Monica Boulevard is limited by walls and landscaping.

A five year pedestrian- and bicycle-involved collision review revealed no collisions at or near any of the alley crossings between January 2010 and December 2014.

Path Crossing Location Type

- Stop Controlled Intersection
- Signalized Intersection

Volumes

- ADT — Saturday Average Daily Traffic - Vehicle Volumes
- XX/Y — Saturday Peak Hour Pedestrian/Bicycle Volumes - Decomposed Granite Path
- XX/Y — Saturday Peak Hour Pedestrian/Bicycle Volumes - Intersection North Leg

Figure 3

Beverly Gardens Volumes

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Best Practice Options for Alley Crossings

Options to improve awareness of pedestrians at the alley crossings were coordinated with efforts associated with the on-going Beverly Gardens Park Project. It was noted during the site visit that vehicle volumes at these locations are low and that most vehicles using the unstriped two-way alleys travel at low speeds due to the narrow roadway and obstacles such as misplaced garbage bins. The primary safety concern for pedestrians at each alley crossing is the limited visibility to motorists due to walls, vegetation and other obstructions. A best practice option is to install decorative pavers of a contrasting color to the pavement outlined by standard crosswalk markings, as well as fluorescent yellow-green (i.e., neon) pedestrian warning signs. Due to limited sight distance and horizontal curvature, specific placement of the signs should be carefully considered. Figure 4 (page 13) shows the recommended improvements for alley intersections at three of the locations. Similar treatments are recommended at the other two alley locations.

Crossings Adjacent to Stop Controlled Intersections

The path crosses 13 two-lane streets with nearby side-street stop control within 50 to 65 feet of Wilshire Boulevard or Santa Monica Boulevard North. Each of these intersections is a three-legged intersection providing access to and from the residential neighborhoods north of Wilshire Boulevard and Santa Monica Boulevard North. The 13 locations are listed in Table 1 (page 9) and shown in Figure 1 with dark blue circles.

Existing Conditions and Collision Analysis

At all of these locations, there are sidewalks separated from the curb and extending between the path and the side street stop-controlled approach with directional curb ramps at the corner of Wilshire Boulevard or Santa Monica Boulevard North to allow pedestrians to cross at the stop-controlled intersection. In all cases, the decomposed granite path also continues beyond the sidewalk and terminates at the roadway without a curb ramp. This creates a confusing environment for both pedestrians and motorists with no clear indication as to where pedestrians should cross.

Existing conditions also lack consistency in crosswalk markings: two intersections have crosswalks marked at the path without any curb ramps (green rows in Table 1), seven intersections have crosswalks marked at the adjacent intersection (grey rows in Table 1), and four intersections do not have any marked crosswalks (orange rows in Table 1).

The intersection at Carmelita Avenue and Santa Monica Boulevard is a unique case at the eastern terminus of the path. The path leads directly to the corner of Carmelita Avenue and Santa Monica Boulevard, a stop-controlled intersection with a pork chop island and channelized turns. Southbound vehicles on Carmelita Avenue must turn right.

A five year pedestrian- and bicycle-involved collision review identified one pedestrian collision and five bicycle collisions along Santa Monica Boulevard at side-street stop-controlled intersections between January 2010 and December 2014. The single pedestrian collision involved a hit and run misdemeanor with the motorist violating the pedestrian's right of way at the intersection of Foothill Road and Santa Monica Boulevard North.

The five bicycle collisions occurred along Santa Monica Boulevard at Alpine Drive, Elm Drive, Arden Drive, Alta Drive, and Sierra Drive. The collision at Alta Drive was identified as a felony hit and run with an unknown violation type. The bicycle collisions at Alpine Drive and Elm Drive were classified as automobile right-of-

way, indicating a bicycle violation. The bicycle collision at Arden Drive was attributed to improper turning, and the collision at Sierra Drive was attributed to unsafe speeds. These bicycle collisions are likely not a result of the infrastructure surrounding the pedestrian crossing locations for the decomposed granite path, but instead occurred along Santa Monica Boulevard. As such, these collisions cannot be addressed through the scope of this project.

Best Practice Options for Stop-Controlled Intersections

Each of the roadways where the path crossing is adjacent to a stop-controlled intersection at Wilshire Boulevard or Santa Monica Boulevard is a two-lane roadway (one lane in each direction) in a residential area with a 25 mph speed limit. Best practice options for City consideration were identified that match the high pedestrian demand, corresponding low vehicular volume and roadway characteristics. These include:

- Add a raised continental crosswalk at the path crossing
- Add fluorescent yellow-green pedestrian signage
- Remove sidewalk connecting to Wilshire Boulevard or Santa Monica Boulevard
- Remove curb ramps at Wilshire Boulevard or Santa Monica Boulevard

The findings from the 2005 Zegeer Report support the installation of marked crosswalks across these two-lane roadways, as there is no evidence that the collision rate will increase even without additional enhancements. Due to the mid-block location, however, it is recommended to include traffic calming features and high visibility pedestrian treatments, including a raised continental crosswalk and fluorescent yellow-green signage to increase visibility and awareness of pedestrians crossing the street. The raised crosswalk feature could also provide the added benefits of reducing travel speeds and discouraging cut-through traffic. It can be designed to include gutters underneath at each end or it can slope down to street grade to allow water to pass, in which case curb ramps would be required. Advance yield lines could accompany each crossing to provide a buffer between motorists and pedestrians. Furthermore, any obstacles should be removed that limit line of sight between approaching motorists and pedestrians, including but not limited to vegetation and parked vehicles. Removal of the sidewalk connection and curb ramps at the corners of Wilshire Boulevard and Santa Monica Boulevard North will further emphasize the single crossing location at the new mid-block crosswalk and reduce confusion for both motorists and pedestrians. Because there is no sidewalk adjacent to these major roadways on either the north or south side of each street, there is no apparent need for pedestrians to be crossing at the intersection. One exception is that there is a sidewalk on the south side of Wilshire Boulevard at Trenton Drive and Carmelita Avenue, but signs are in place prohibiting pedestrians from crossing Wilshire Boulevard.

Table 1 presents those locations where the above best practice options could be applied or where some modification may be needed to either preserve existing secondary paths at Carmelita Avenue (Figure 4), Elm Drive (Figure 7), and Maple Drive (Figure 7) or to maintain connectivity for bus passengers at Walden Drive (Figure 4).

TABLE 1 BEST PRACTICE OPTIONS FOR PATH NEAR STOP CONTROL

Best Practice Options for Crossings Adjacent to Stop Control:

- ➔ Add raised continental crosswalk
- ➔ Add fluorescent yellow-green pedestrian signage
- ➔ Remove sidewalk connecting to Wilshire Boulevard or Santa Monica Boulevard
- ➔ Remove curb ramps at Wilshire Boulevard or Santa Monica Boulevard

Minor Street	Parallel Major Street	Existing Crosswalk Treatment	Recommendation
Trenton Drive	Wilshire Boulevard	Standard marked crosswalk at the path (midblock)	Standard recommendations above
Carmelita Avenue	Wilshire Boulevard	Standard marked crosswalk at the path (midblock)	Standard recommendations except keep the portion of sidewalk on the east side of Carmelita Avenue that connects to the recently installed secondary path (Figure 4)
Walden Drive	Santa Monica Boulevard	No marked crosswalk	Standard recommendations except keep the sidewalk connecting the bus stop to the path and keep curb ramps (Figure 4)
Linden Drive	Santa Monica Boulevard	Standard marked crosswalk at the intersection	Standard recommendations above
Alpine Drive	Santa Monica Boulevard	Standard (faded) marked crosswalk at the intersection	Standard recommendations above (Figure 6)
Foothill Road	Santa Monica Boulevard	Standard marked crosswalk at the intersection	Standard recommendations above
Elm Drive	Santa Monica Boulevard	Standard marked crosswalk at the intersection	Standard recommendations except keep the portion of sidewalk along the east side of Elm Drive that connects to the secondary path (Figure 7)
Maple Drive	Santa Monica Boulevard	No marked crosswalk	Standard recommendations except keep the portion of sidewalk along the west side of Maple Drive that connects to the secondary path (Figure 7)
Hillcrest Road	Santa Monica Boulevard	Standard marked crosswalk at the intersection	Standard recommendations above
Arden Drive	Santa Monica Boulevard	Standard marked crosswalk at the intersection	Standard recommendations above
Alta Drive	Santa Monica Boulevard	Standard marked crosswalk at the intersection	Standard recommendations above
Sierra Drive	Santa Monica Boulevard	No marked crosswalk	Standard recommendations above
Carmelita Avenue	Santa Monica Boulevard	No marked crosswalk	Remove path connection to curb on Carmelita and add a 2-stage continental crosswalk that is not raised (Figure 8)

Traffic & Parking Commission Comment: *It is important to provide consistency; as such, there is support to remove the recently constructed secondary path east of Carmelita Avenue (west end).*

One other exception to the standard best practice options is at the intersection with the pork chop island at Carmelita Avenue and Santa Monica Boulevard (Figure 8). At this location, the proposed treatment is a two-stage continental crosswalk along Santa Monica Boulevard. This will provide high visibility crosswalks with an existing refuge island. Given that the crosswalks are not set back from the intersection and there is an existing median refuge island, consideration of raised crosswalks is not recommended. In addition, the fluorescent yellow-green signage is not included as a recommendation since the southbound approach is stop controlled and the crossings are located at an intersection, which is an expected location for motorists to encounter pedestrians.

Crossings Adjacent to Signalized Intersections

The path crosses ten streets with nearby signal control at Wilshire Boulevard or Santa Monica Boulevard (indicated by yellow circles on Figure 1). Each of these intersections includes multiple lanes and four approaches. These intersections provide a direct connection between the residential neighborhoods north of Wilshire Boulevard and Santa Monica Boulevard to commercial centers of Beverly Hills and surrounding areas.

Existing Conditions and Collision Analysis

At all ten signalized intersections adjacent to the path, there are standard crosswalks striped at the north leg of the intersection to serve path users. The crossing distance at the signalized intersections ranges from 30 feet to 60 feet with the exception of an 85-foot (6-lane) crossing distance at Rodeo Drive.

The existing path configuration varies along the corridor. At five of the path crossings near signalized intersections, the decomposed granite path continues beyond the sidewalk that runs along the minor street and terminates at the roadway curb without a curb ramp (locations identified in Table 2 on page 12). This creates a confusing environment for both pedestrians and motorists since the path leads pedestrians to the roadway edge but not to the nearby marked crosswalk. Furthermore, at three of the path crossings near signalized intersections, there is no diagonal, direct pedestrian connection to the crosswalk at the intersection (locations identified in Table 2). At these three locations, the path terminates at the sidewalk along the minor street at a right angle, approximately 60 feet north of the signalized intersection. This indirect access may encourage instances of midblock crossings or the use of shortcuts through the landscaping.

The five year pedestrian- and bicycle-involved collision review identified 6 bicycle and 11 pedestrian collisions. Of these collisions, only one bicycle (at Beverly Drive) and two pedestrian collisions (at Roxbury Drive and Rexford Drive) occurred on the minor street approach. The remaining five bicycle and nine pedestrian collisions occurred along Wilshire Boulevard and Santa Monica Boulevard and are likely not a result of the infrastructure along the pedestrian path, but instead are a result of conditions along Wilshire and Santa Monica Boulevards. As such, these collisions cannot be addressed through the scope of this project.

The collision review identified five pedestrian collisions along a single block between Bedford Drive and Camden Drive. Two collisions occurred on Santa Monica Boulevard at the Bedford Drive intersection, two

collisions occurred approximately 100 feet east of the Bedford Drive intersection and one collision occurred approximately 150 feet west of the Camden Drive intersection. The violation type for these five collisions included improper turning, pedestrian violation, and pedestrian right of way. This block is the only block along the corridor that includes a contiguous sidewalk, without a grass buffer, adjacent to Santa Monica Boulevard.

Best Practice Options for Signalized Intersections

Each of the roadways where the path crossing is adjacent to a signalized intersection at Wilshire or Santa Monica Boulevards is more than two lanes wide and carries more traffic likely at higher speeds than those adjacent to the stop-controlled intersections because each carries through traffic to and from the south. For these reasons and because signal control is available in very close proximity, the following best practice options have been identified for the path crossings adjacent to signals:

- Remove direct path connection to a mid-block crossing (five locations total)
- Add a direct path connection to the marked, signal controlled crosswalk (three locations total)

These best practice options plus some supplemental options are summarized in Table 2 for each location.

A supplemental option is for the inclusion of an east leg crosswalk at the Whittier Drive and Wilshire Boulevard intersection. This crossing will improve pedestrian access to the developments along Wilshire Boulevard. Providing crosswalks at all four legs of an intersection enhances pedestrian mobility and will provide direct access to the path from the south side of Wilshire Boulevard.

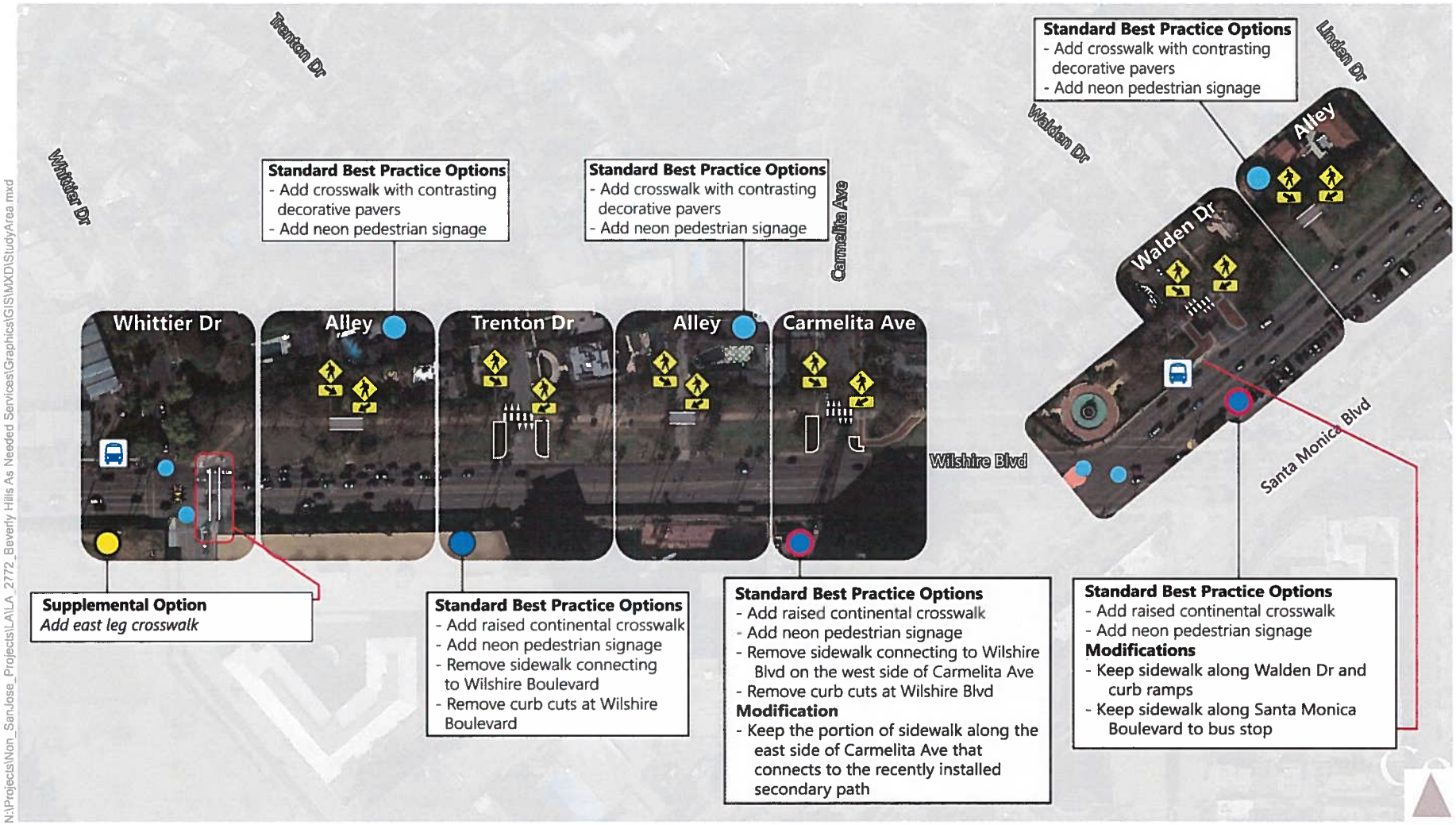
The collision review identified the highest frequency of pedestrian collisions between Bedford Drive and Camden Drive. This is the only location with a sidewalk contiguous with the curb on the north side of Santa Monica Boulevard. Removing the sidewalk along this segment is another supplemental option to provide consistency with the remainder of the corridor and a buffer between pedestrians and motor vehicles.

A supplemental option has also been identified at Rodeo Drive and Santa Monica Boulevard. Curb extensions could be constructed to reduce the 85-foot crossing distance to a maximum of 64 feet. Turning movement counts could be collected and reviewed to determine whether a further reduction could be achieved by eliminating the exclusive southbound right-turn lane.

A final supplemental option is the installation of no pedestrian crossing signage, two on each side of Canon Drive at the intersection points of the path and the sidewalk to prohibit mid-block crossings and to direct pedestrians to the signal.

TABLE 2 BEST PRACTICE OPTIONS FOR PATH NEAR SIGNAL CONTROL

Minor Street	Parallel Major Street	Remove Path Connection to Mid-Block Crossing	Add Direct Connection to Signalized Crossing	Supplemental Improvements
Whittier Drive (Figure 4)	Wilshire Boulevard	N/A	N/A	Add east-leg crosswalk
Roxbury Drive	Santa Monica Boulevard	Both sides	West side only	N/A
Bedford Drive	Santa Monica Boulevard	N/A	N/A	Remove sidewalk between Bedford Drive and Camden Drive on the north side and contiguous with Santa Monica Boulevard
Camden Drive	Santa Monica Boulevard	N/A	N/A	Remove sidewalk between Bedford Drive and Camden Drive on the north side and contiguous with Santa Monica Boulevard
Rodeo Drive (Figure 5)	Santa Monica Boulevard	N/A	N/A	Add curb extensions to the north leg to reduce crossing distance and vehicle speeds
Beverly Drive (Figure 5)	Santa Monica Boulevard	Both sides	N/A	
Canon Drive (Figure 5)	Santa Monica Boulevard	N/A	N/A	Add "Do Not Cross" signs at the termination of the two midblock paths on either side of Canon Drive
Crescent Drive (Figure 6)	Santa Monica Boulevard	East side only	N/A	
Rexford Drive (Figure 6)	Santa Monica Boulevard	Both sides	Both sides	
Palm Drive	Santa Monica Boulevard	Both sides	Both sides	



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Bike Collision

Pedestrian Collision

Bus Stop

Signalized Intersection

Crosswalk with Contrasting Decorative Pavers

Raised Continental Crosswalk

Remove Existing

Keep Existing

Path Crossing Location Type

Alley

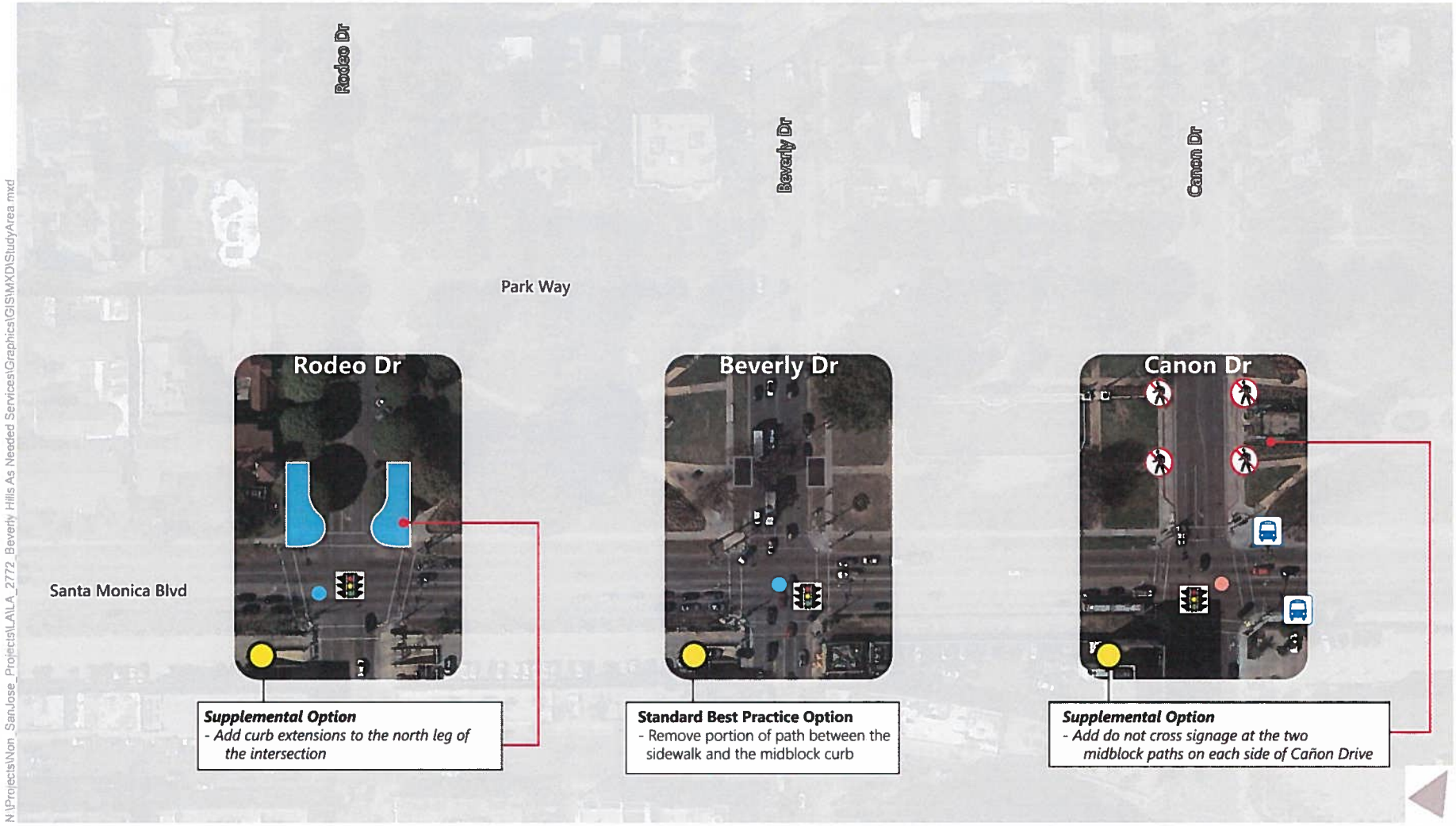
Adjacent to Stop Controlled Intersection

Adjacent to Signalized Intersection

Includes Modifications to Standard Treatments Proposed

Figure 4

Whittier Drive to Alley East of Walden Drive



Bike Collision

Pedestrian Collision

Bus Stop

Signalized Intersection

Add *Do Not Cross* Signage

Remove Existing

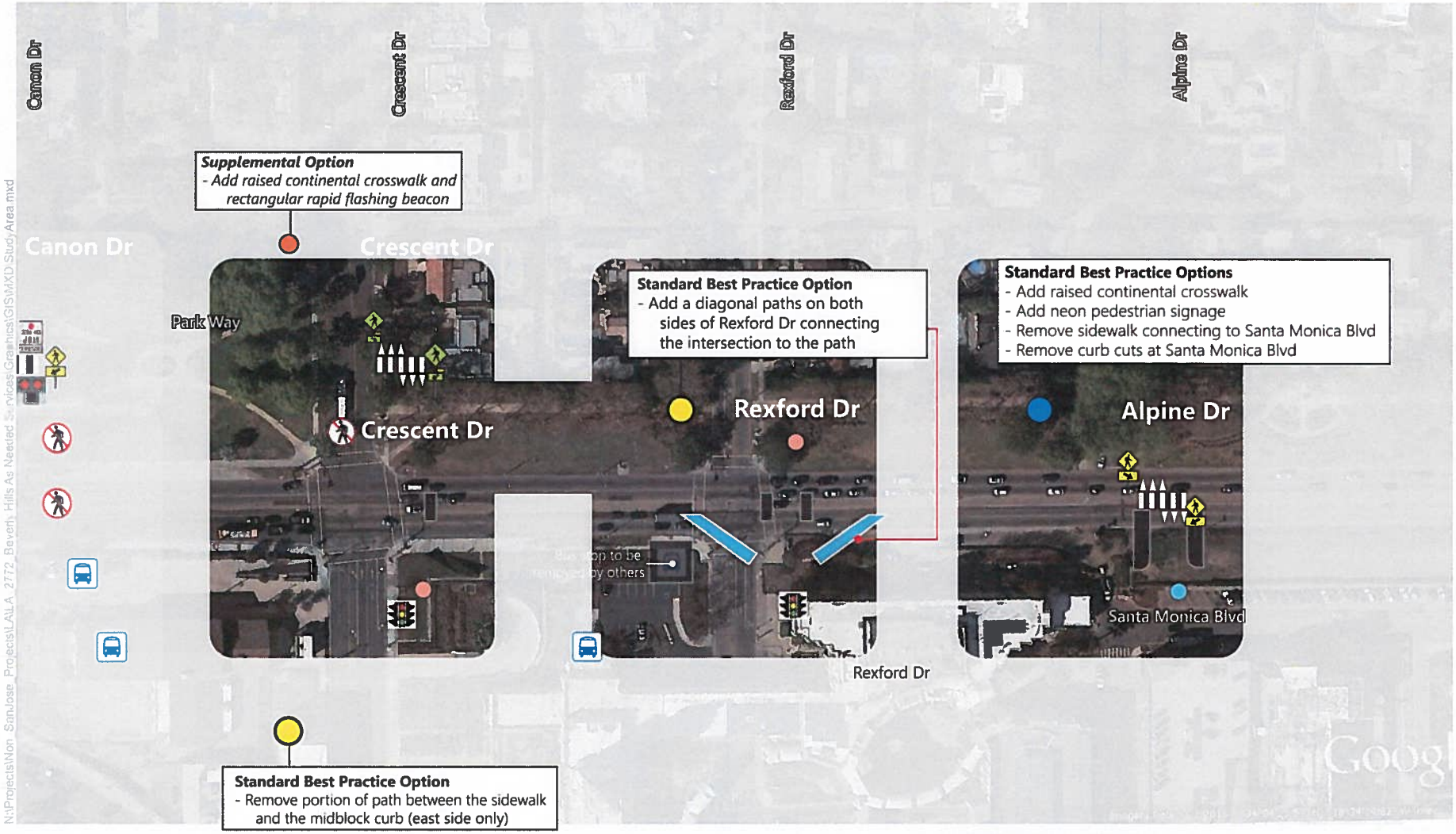
Add Curb Extensions

Path Crossing Location Type

Adjacent to Signalized Intersection

Figure 5

Rodeo Drive to Canon Drive



Bike Collision

Pedestrian Collision

Bus Stop

Signalized Intersection

Raised Continental Crosswalk

Rectangular Rapid Flashing Beacon (RRFB)

Remove Existing

Add Path Connection

Add *Do Not Cross* Signage

Path Crossing Location Type

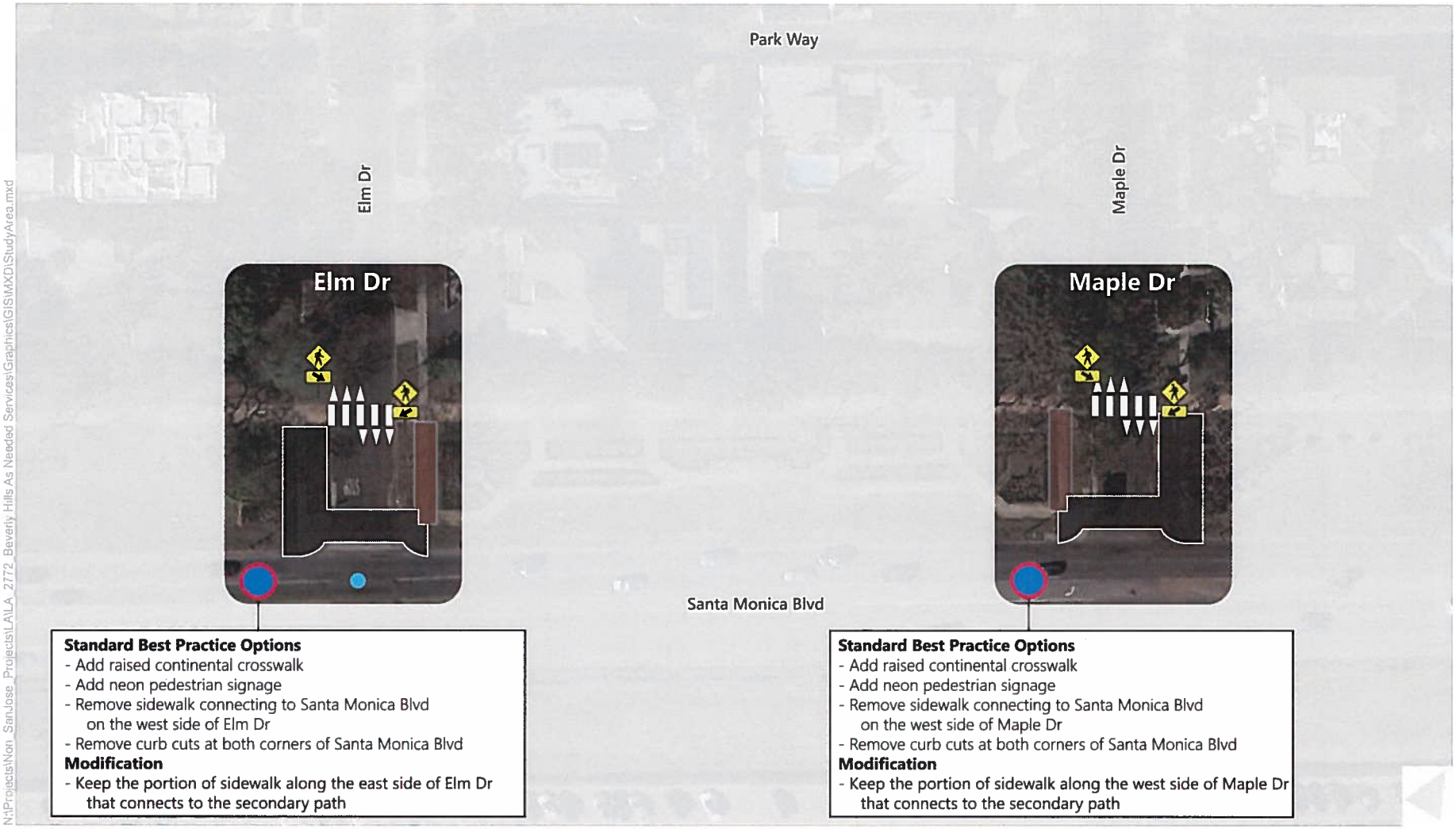
Adjacent to Stop Controlled Intersection

Adjacent to Signalized Intersection

South Leg Crossing at Park Way

Figure 6

Crescent Drive to Alpine Drive



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Bike Collision

Pedestrian Collision

Raised Continental Crosswalk

Remove Existing

Keep Existing

Path Crossing Location Type

Adjacent to Stop Controlled Intersection

Includes Modifications to Standard Treatments Proposed

Figure 7

Elm Drive and Maple Drive

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Bike Collision

Pedestrian Collision

Signalized Intersection

Continental Crosswalk

Remove Existing

Path Crossing Location Type

Adjacent to Stop Controlled Intersection

Includes Modifications to Standard Treatments Proposed

Figure 8

Carmelita Avenue (Eastern Terminus)

PARK WAY AT BEVERLY GARDENS PARK

In response to concerns for pedestrian safety on North Rodeo Drive communicated by representatives of the Beverly Hills Presbyterian Church, City staff asked for an evaluation of whether a marked crosswalk would be appropriate across North Rodeo Drive at Park Way. Based on initial field observations and the level of pedestrian activity at this location as well as the intersections to the east along Beverly Gardens Park, it was recommended that the review be expanded to include North Beverly Drive, North Canon Drive and North Crescent Drive.

EXISTING CONDITIONS

Park Way functions as an alley west of North Rodeo Drive and east of North Crescent Drive. Between North Rodeo Drive and North Crescent Drive, including intersections with North Beverly Drive and North Canon Drive, it is a two lane roadway adjacent to and north of Beverly Gardens Park with angled, metered parking on the south side and parallel parking on the north side. Park Way is considered the side street and is stop controlled at each of these four intersections. All four of the major streets are uncontrolled. Although there are no marked crosswalks along Park Way to cross the major streets at these four intersections, pedestrians can legally cross the street at any intersection per the California Vehicle Code unless posted otherwise. The only location with crossing prohibition signage is on the south side of Park Way at North Rodeo Drive. The signs direct pedestrians to use the signalized crossing at the Santa Monica Boulevard traffic signal. Despite this signage, there are many pedestrians observed crossing at this location.

Vehicle and pedestrian counts were collected to quantify the level of activity at these locations. Data on pedestrian activity was collected across multiple high-activity periods, including the pedestrian peak hour as identified in the Southern California Council of Governments Bicycle Count Training Manual (Saturdays from 12:00 – 2:00 PM), on Sunday mornings between services at the adjacent Beverly Hills Presbyterian Church (Sundays from 9:30 – 11:30 AM), and on weekday mornings during the church's preschool drop-off time (Tuesdays from 8:00 – 10:00 AM). Following data collection, we completed several site visits to develop context sensitive best practice options.

The peak hour north/south vehicle volume on Rodeo Drive was identified as 673 vehicles. Pedestrian counts were collected across a range of high-level pedestrian activity times on a weekday morning, a Saturday afternoon, and a Sunday mid-morning. During the heaviest one-hour peak (occurring Sunday morning), 85 pedestrians crossed in the east/west direction. Of the 85 pedestrians who crossed east/west, 25 – almost 30% – crossed away from the intersection, mid-block between Park Way and Santa Monica Boulevard. The remaining 60 pedestrians crossed at the intersection. Interestingly, 23 of those crossings occurred on the south side of the intersection where crossings are prohibited. There were only four bicycles counted during the entire period, one traveling east along Park Way, and three traveling south on Rodeo Drive.

The peak hour north/south vehicle volume on Beverly Drive was identified as 1,121 vehicles. Pedestrian counts were collected on a Saturday afternoon and a Sunday mid-morning. During the heaviest one-hour peak (occurring Sunday morning), 49 pedestrians crossed in the east/west direction. Of the 49 pedestrians who crossed east/west, five crossed away from the intersection, mid-block between Park Way and Santa Monica Boulevard. The remaining 44 pedestrians crossed at the intersection. There were only nine bicycles counted during the entire period, one traveling east along Park Way, and eight traveling north or south on Beverly Drive.

The peak hour north/south vehicle volume on Canon Drive was identified as 960 vehicles. Pedestrian counts were collected on a Saturday afternoon and a Sunday mid-morning. During the heaviest one-hour peak (occurring Saturday afternoon), 124 pedestrians crossed in the east/west direction. Of the 124 pedestrians who crossed east/west, 33 – more than a quarter – crossed away from the intersection, mid-block between Park Way and Santa Monica Boulevard. The remaining 91 pedestrians crossed at the intersection. There were only six bicycles counted during the entire period, five traveling east or west along Park Way, and one traveling north on Canon Drive.

The peak hour north/south vehicle volume on Crescent Drive was identified as 903 vehicles. Pedestrian counts were collected on a Saturday afternoon and a Sunday mid-morning. During the heaviest one-hour peak (occurring Sunday morning), 22 pedestrians crossed in the east/west direction. Of the 22 pedestrians who crossed east/west, 12 – more than half – crossed away from the intersection, mid-block between Park Way and Santa Monica Boulevard. The remaining 11 pedestrians crossed at the intersection. There were only 11 bicycles counted during the entire period, five traveling east or west along Park Way, and six traveling north or south on Crescent Drive.

Wallis Annenberg Center for the Performing Arts was contacted to determine whether some of the pedestrian activity could be related to patrons parking in the area and walking to the Center. There were shows on the Saturday and Sunday of data collection, and the first show time was noon each day. The peak hour of pedestrian activity occurred Sunday morning at Rodeo Drive, Beverly Drive and Crescent Drive and was likely more influenced by activity associated with the Presbyterian Church and Beverly Gardens Park visitors. The peak hour of pedestrian activity at Canon Drive occurred Saturday afternoon at 12:45-1:45 PM. Due to its close proximity to the Center and higher pedestrian volume in comparison to the other locations, this peak may reflect more activity associated with the Center; however, the Sunday morning volume at this location was also higher than the other locations.

BEST PRACTICE OPTIONS ALONG PARK WAY

Along each of the four major streets, the side-street stop-controlled intersection with Park Way is approximately 250 feet north of each signalized intersection with Santa Monica Boulevard. A marked crosswalk is a best practice option at locations near a pedestrian generator and within 300 feet of an existing crosswalk only if over 40 pedestrians use the crossing per hour. While the intersection with Park Way is less than 300 feet from the intersection with Santa Monica Boulevard, pedestrian volumes are high enough to warrant marked pedestrian crossings at Rodeo Drive, Beverly Drive and Canon Drive. The pedestrians observed crossing east to west, whether at Park Way or mid-block, were likely park-goers utilizing the grounds and sights within Beverly Gardens Park and crossing east/west to continue their park sojourn along pre-established park paths, or were congregants of Beverly Hills Presbyterian Church seeking the shortest route to the public parking spaces along Park Way north of Beverly Gardens Park. Some may also be associated with the Center for Performing Arts when shows are happening.

Given the high pedestrian activity at Rodeo Drive, Beverly Drive, and Canon Drive, a marked crosswalk with high level safety enhancements could be implemented, including a pedestrian hybrid beacon and a continental crosswalk along the south leg of each intersection. The fact that a large number of crossings take place across Rodeo Drive where there is currently crossing prohibition signage demonstrates the demand for crossing at this location. An additional treatment option at Rodeo Drive is a curb extension (or bulb-out) on the west side of the street to improve visibility associated with the curvature in the roadway,

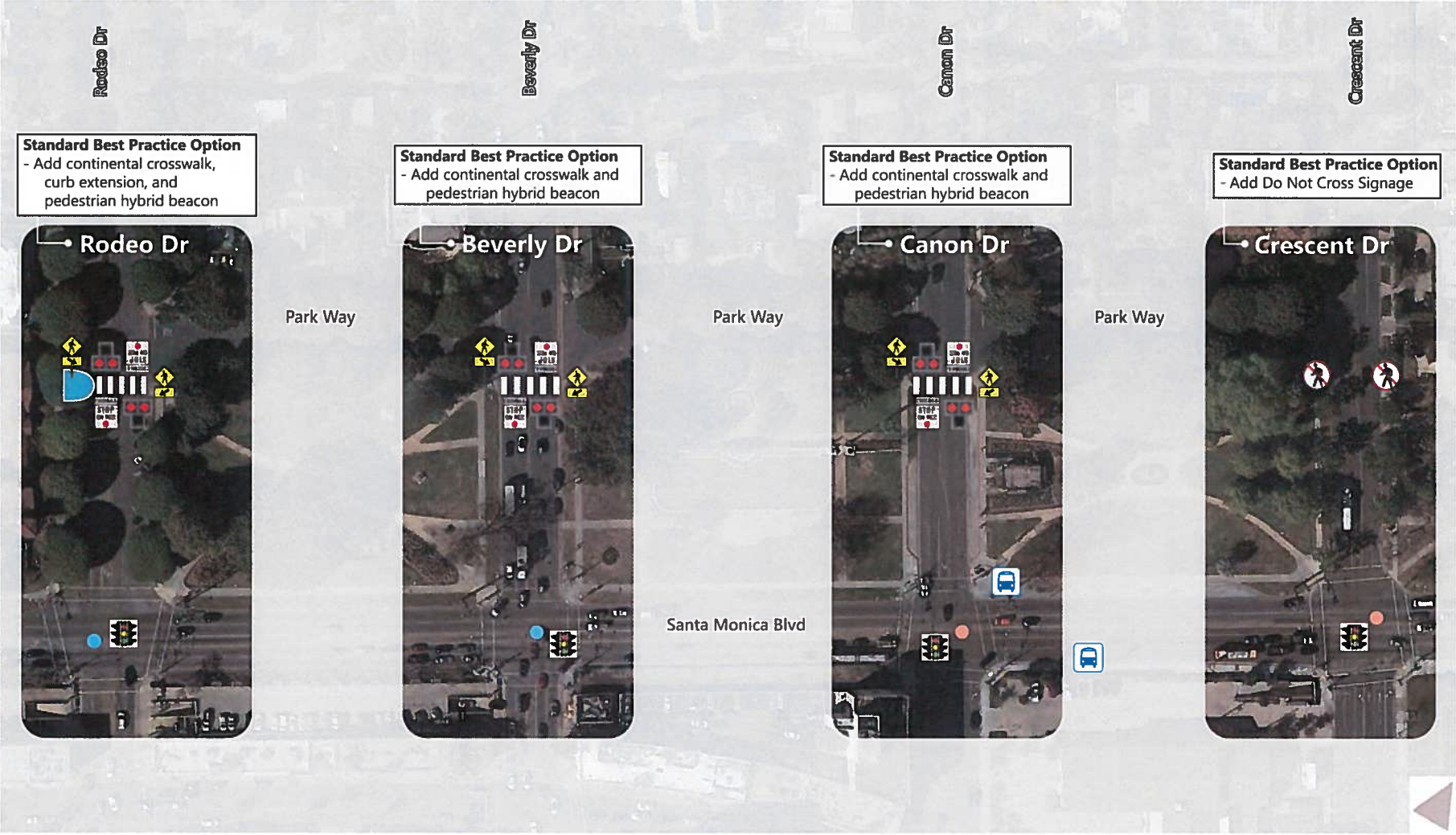
on-street parking and a large tree immediately north of where the crosswalk would be located. Removal or relocation of one accessible parking stall would also be needed.

In addition, a pedestrian hybrid beacon could be considered at Rodeo Drive, Beverly Drive, and Canon Drive. A pedestrian hybrid beacon provides for a protected crossing similar to a traditional traffic signal. The vehicle indications are dark when no pedestrians are present. Upon arrival, the pedestrian would see an Upraised Hand (symbolizing don't walk) pedestrian indication. The pedestrian would press a push button similar to a traditional traffic signal to alert the signal control equipment that there is demand for a crossing. The vehicle signal would then display flashing yellow, followed by steady yellow, followed by steady red. Concurrent with the steady red vehicular indication, the pedestrian indication would change to a Walking Person (symbolizing walk). After a pre-determined number of seconds, the pedestrian indication would change to a flashing Upraised Hand (symbolizing do not start crossing) and the vehicle indication would change to flashing red, which means that after coming to a stop vehicles may proceed with caution. The signal indication then reverts back to dark until the next actuation. A benefit of this type of control is that pedestrians cannot cross at any time resulting in a continuous interruption to traffic flow as they can do today but rather are grouped together. Furthermore, the system can be designed to communicate and coordinate with the adjacent signal to stop traffic at preferred times.

The California Manual on Uniform Traffic Control Devices Section 4F.02 – Guidance, Part A recommends that pedestrian hybrid beacons be installed at least 100 feet from side streets or driveways controlled by stop or yield signage. However, recent studies conducted by TTI and the City of Tucson, Arizona determined that pedestrian hybrid beacons placed at minor intersections or major driveways were successful at reducing pedestrian-involved collisions. The California Manual on Uniform Traffic Control Devices guidance was developed prior to publication of these studies. Additionally, the California Manual on Uniform Traffic Control Devices statement regarding pedestrian hybrid beacon placement is guidance ("should") and not a requirement ("shall"). Thus, engineering judgment is permitted for interpretation and, at these locations, a pedestrian hybrid beacon is most appropriate.

Due to the lower volumes observed on Crescent Drive (22 during the peak hour) as well as its location at the terminus of Beverly Gardens Park with no path continuation on the east side, crossing prohibition signage could instead be considered to direct pedestrians to the signalized crossing at Santa Monica Boulevard.

All of the best practice options along Park Way are illustrated on Figure 9.



Bike Collision

Pedestrian Collision

Bus Stop

Signalized Intersection

Add *Do Not Cross* Signage

Continental Crosswalk

Add Curb Extension

Pedestrian Hybrid Beacon (with signage)

Figure 9

Rodeo Drive to Crescent Drive

Traffic & Parking Commission Question: *Consider scaling proposal back to rectangular rapid flashing beacon's along Park Way.*

Answer: Under existing conditions, the crosswalks along Park Way are not marked. Legally, pedestrians can cross unless a sign is posted otherwise. Signs are specifically posted at Rodeo Drive prohibiting crossings across the south side of Park Way, although our observations indicate that crossings are taking place here. Motorists are required to yield to pedestrians in a marked or unmarked crosswalk at an intersection, and pedestrians have the duty of using due care for his or her safety (California Vehicle Code section 21950). Because the crossings are uncontrolled and unmarked, it is likely that pedestrians now cautiously wait for a gap in traffic before crossing.

The installation of a rectangular rapid flashing beacon system would not change the legal traffic control conditions at these crossings. Motorists would still be required to yield to pedestrians, and pedestrians would still have the duty of using due care for his or her safety. The purpose of the flashing lights is solely to bring the driver's attention to the presence of a pedestrian. With the installation of a rectangular rapid flashing beacon system, pedestrians may choose to activate the lights using the push button and immediately cross upon activation without waiting for a gap. This will have an effect on vehicle operations, particularly given the high pedestrian activity in this area, as there could be fairly regular activations during peak periods. For this reason, pedestrian hybrid beacons are preferred in high pedestrian activity areas. With a pedestrian hybrid beacon, pedestrians would have an Upraised Hand indication (symbolizing don't walk) until such time as when the vehicle phase is green for Santa Monica Boulevard and red for the cross streets (Rodeo Drive, Beverly Drive, and Canon Drive) that also intersect the subject crosswalks. This would minimize the impact on vehicle flow on these streets. Furthermore, the pedestrian hybrid beacon provides a controlled crossing for pedestrians, so this option optimizes pedestrian safety.

Furthermore, studies have shown a lower rate of motorist yielding at rectangular rapid flashing beacons compared to pedestrian hybrid beacons, namely 82% versus 97%.

Traffic & Parking Commission Question: *General concern about motorist compliance with pedestrian hybrid beacons along Park Way.*

Answer: While pedestrian hybrid beacons (also know as a HAWK signal) are a less known traffic control device in this area, they are an approved device in the federal and the California Manual on Uniform Traffic Control Devices. They were developed and first deployed in Tucson, Arizona starting in 2000. It was considered an experimental treatment since it had not yet been approved by the Federal Highway Administration, but it was later adopted in 2009. A study was published in 2006 documenting a 97% motorist compliance rate (i.e., yielding or stopping where required) at existing pedestrian hybrid beacons (Improving Pedestrian Safety at Unsignalized Crossings, Publication TCRP report 112/NCHRP report 562, 2006). A study published by the Federal Highway Administration in 2010 demonstrated a 69% reduction in pedestrian crashes where PHB's had been installed (Safety Effectiveness of the HAWK Pedestrian Crossing Treatment, FHWA-HRT-10-042, July 2010). It is recognized, however, that new installations in an area not yet accustomed to this traffic control device should be accompanied by education and enforcement campaigns. Many agencies have developed flyers that illustrate the use of the pedestrian beacon.

The intended operation is to interconnect each pedestrian hybrid beacon with the adjacent traffic signal on Santa Monica Boulevard. This will allow for coordination between the two traffic control devices. Specifically, pedestrians would only be allowed to cross when the Santa Monica Boulevard approaches have a green light. As such, approaching vehicles would have just completed a left or right turn, which is typically completed at around 15 mph or less. A vehicle traveling at 15 mph requires 100 feet of sight distance to be able to perceive, react and safely stop (Caltrans' *Highway Design Manual*, Table 201.1). The distance between Santa Monica Boulevard and Park Way is over 200 feet. For a vehicle traveling at 25 mph, the required stopping sight distance is 150 feet, so adequate distance is provided even for a faster vehicle traveling northbound toward one of the crosswalk locations.

Pedestrian hybrid beacons are becoming more commonplace across California. Currently, there have been systems approved (and most installed) by the following California agencies:

Caltrans	Berkeley	Santa Rosa
San Francisco	Oakland	Sacramento
Placer County	Santa Clara	San Jose
Union City	Atherton	Chula Vista
Downey	San Diego	Garden Grove

SOUTH SANTA MONICA BOULEVARD & LASKY DRIVE

EXISTING CONDITIONS

The T-intersection of Lasky Drive with South Santa Monica Boulevard is a side-street stop-controlled intersection located in the City of Beverly Hills immediately west of the major arterial intersection of Santa Monica Boulevard, South Santa Monica Boulevard, and Wilshire Boulevard. South Santa Monica Boulevard provides two lanes for through traffic in either direction, as well as parking on both sides of the road. The curb-to-curb width is 60 feet. The speed limit is 25 miles per hour. At the intersection with Lasky Drive, South Santa Monica Boulevard is divided by a raised median and turning movements from Lasky Drive are limited to right turns only. A stop-controlled right turn lane from Santa Monica Boulevard onto South Santa Monica Boulevard is located almost directly across the raised center median from Lasky Drive, effectively creating a southbound fourth leg to the intersection.

A standard crosswalk extends diagonally north to south across South Santa Monica Boulevard immediately to the west of the intersection with Lasky Drive. The diagonal nature of the marked crosswalk extends the pedestrian crossing distance across South Santa Monica Boulevard to 85 feet. Pedestrian visibility is limited on the eastbound approach by parked cars and from the southbound approach by the alignment of the access lane from Santa Monica Boulevard. Existing red curb extends for 20 feet in advance of the eastbound approach and 15 feet in advance of the westbound approach.

In traffic counts collected on a Tuesday in March, 2016, more than 23,000 daily vehicle trips were recorded on South Santa Monica Boulevard, including almost 1,900 vehicle trips during the morning commute peak hour. Pedestrian volumes were collected during the typical pedestrian peak hour, which occurs in the middle of the day on a Saturday. Sixty pedestrians were observed using the crosswalk on South Santa Monica Boulevard in the pedestrian peak hour, for an average of one pedestrian per minute.

A five year pedestrian- and bicycle-involved collision review revealed no collisions at or near the intersection between January 2010 and December 2014.

According to staff, this crosswalk was originally installed in 1962 with the condition that a crossing guard be provided for the high school. The crossing guard was later moved to another location but the crosswalk remained. There have been discussions dating back to the late 1960's about whether to keep the crosswalk at this location. The City's current Traffic Engineer has advocated for removal of this crosswalk in recent years, so this was examined as an option. During the weekend peak hour, there were 60 pedestrians counted using this crossing. Activity is likely higher during the peak hour on a weekday given the active, adjacent commercial land use. Legally pedestrians can cross at any location along South Santa Monica Boulevard between the signals at Charleville Boulevard and Wilshire Boulevard. This is because there is an intervening unsignalized intersection at Lasky Drive, so crossing the street anywhere between Charleville Boulevard and Wilshire Boulevard would not meet the definition of jaywalking as defined in the California Vehicle Code (Section 21955). As such, removing this crosswalk would likely result in pedestrians still crossing at this location or some other mid-block location nearby. Instead, strategies to increase vehicular-pedestrian separation and enhance motorist awareness were further explored. Technologies have advanced significantly since the crosswalk was originally installed, and these technologies have become commonplace as a way of creating more walkable communities.

CROSSWALK TREATMENT OPTIONS

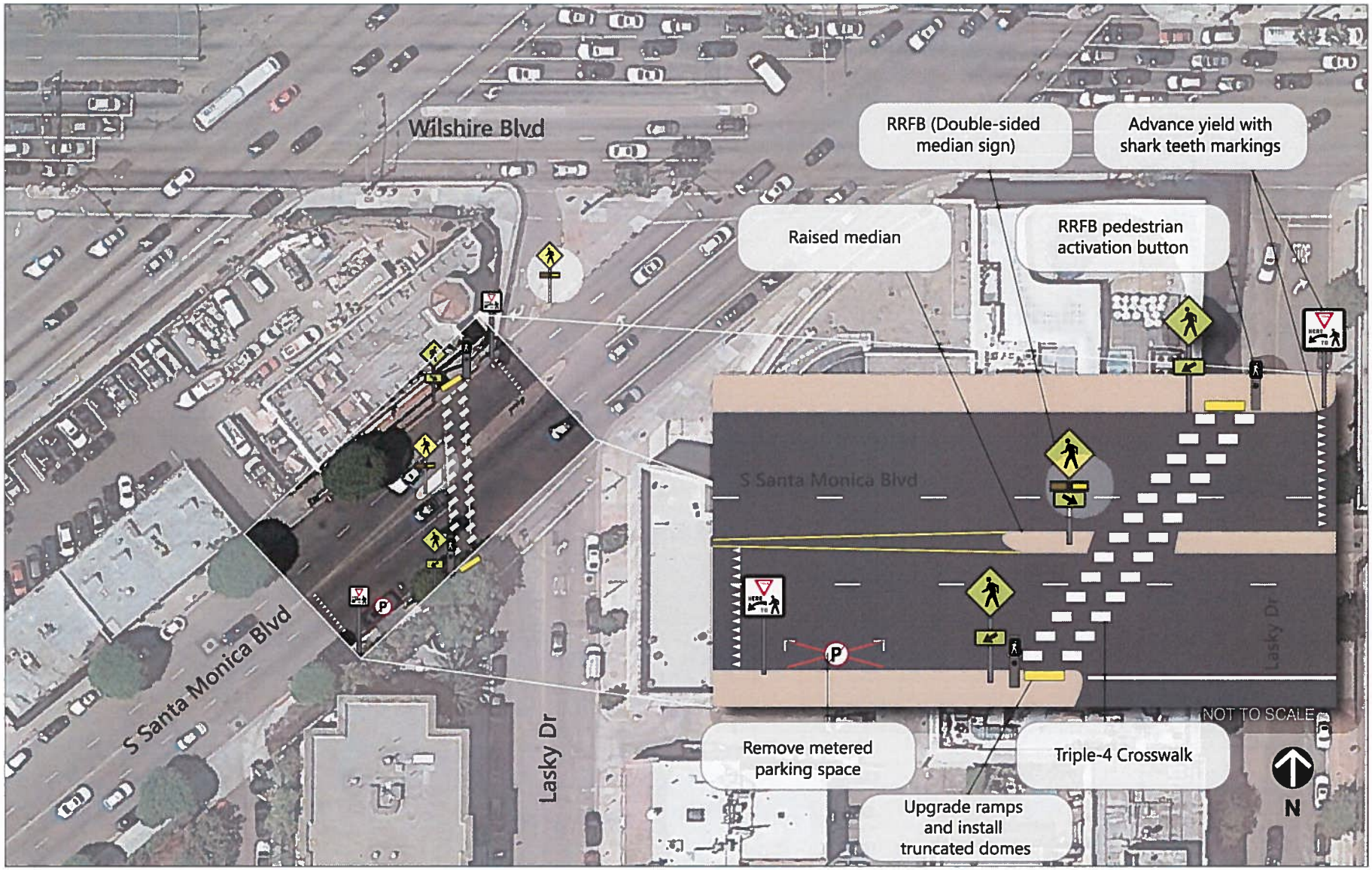
Best practice options for this location are illustrated on Figure 10 and described below.

A pedestrian hybrid beacon displays flashing yellow upon pedestrian actuation, followed by steady yellow, followed by steady red, followed by flashing red. It then reverts to dark until the next actuation. At its shortest distance, the marked crosswalk is less than 150 feet to the intersection with Wilshire Boulevard. Eastbound traffic on South Santa Monica Boulevard waiting to cross Wilshire Boulevard at the signalized intersection frequently queues up past the intersection with Lasky Drive. Similarly, traffic stopped in the westbound direction by the pedestrian hybrid beacon could queue back to Wilshire Boulevard. As such, a pedestrian hybrid beacon was not further considered for this location.

High visibility crosswalks are markings that are visible to the approaching motorist from a further distance compared to traditional crosswalks. Examples include continental crosswalks and triple-four crosswalks. Triple four crosswalks include an unpainted center channel bound with high-visibility striped markings on either side, with the markings and the center channel forming three 4-foot wide zones. The center channel guides pedestrians along the safest path within the crossing and prevents pedestrians from straying outside the crossing. Reflectors placed facing on-coming traffic in each direction of travel provide an additional alert to drivers about the crosswalk. See Figure 11 for an illustration of a triple-four crosswalk.

Figure 11. Triple-four high visibility crosswalk.

Currently, there are roadside pedestrian crosswalk warning signs for both approaches. The signage for the westbound approach includes a W54(CA) (pedestrian symbol with crosswalk lines) with a "PED XING" plaque located beneath on a street light immediately before the crosswalk. The larger sign is bent and leaning



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Santa Monica Boulevard & Lasky Drive Crossing

FIGURE 10

because it extends beyond the sidewalk into the roadway and is likely hit by larger vehicles turning right from the access lane from Santa Monica Boulevard. The same two signs are in place for the eastbound approach on a street light located about 20 feet before the crosswalk. This combination of signs has been deleted from the California Manual on Uniform Traffic Control Devices and replaced with the W11-2 (pedestrian symbol without crosswalk lines) and W16-7P (downward pointing arrow). The existing signs could therefore be replaced and upgraded to fluorescent yellow-green for greater conspicuity.

The combination of high vehicular volume and pedestrian activity results in a large number of conflicting movements. The multi-lane configuration further exacerbates the likelihood of a conflict given the potential for multiple-threat crashes. Multiple-threat crashes occur when a driver in one lane yields to a pedestrian in a crosswalk, obscuring the pedestrian from view of a driver in the adjacent lane, increasing the risk that the vehicle in the other lane will strike the pedestrian as the pedestrian clears the vehicle in the first lane and steps out in front of the second vehicle. Figure 12 illustrates a typical multiple-threat scenario.

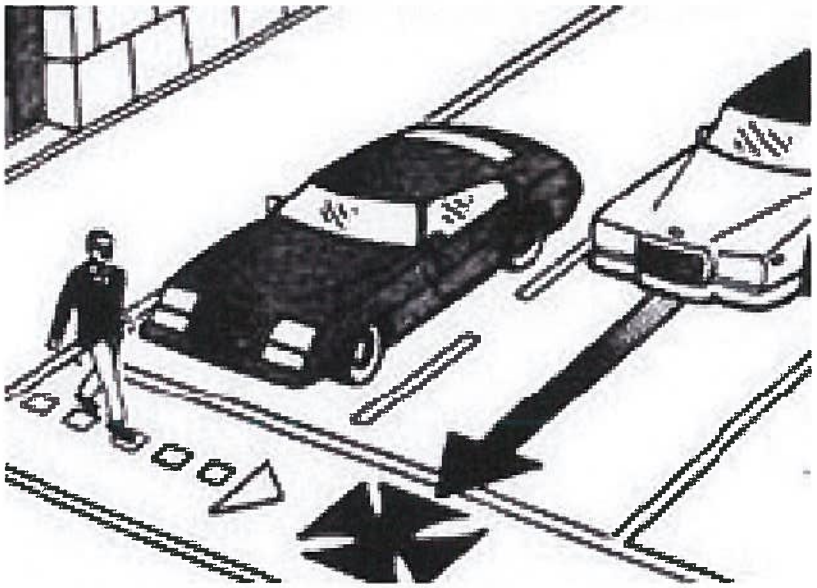


Figure 12. Illustration of multiple-threat crashes.

On multi-lane roadways such as South Santa Monica Boulevard, a line of painted triangles (shark teeth) are used before an uncontrolled pedestrian crossing to indicate the safest place for a driver to stop when yielding to a pedestrian to maximize pedestrian visibility for other drivers and prevent multiple-threat crashes. Advanced yield lines should be used in conjunction with "Yield Here for Pedestrians" signage. Figure 13 also illustrates advanced yield lines being used at an unsignalized crossing. Requiring vehicles to yield further from the crosswalk reduces the risk of multiple-threat crashes, as described previously. Per the California Manual on Uniform Traffic Control Devices (Section 3B.16), advanced yield lines should be placed 20 to 50 feet in advance of the nearest crosswalk line, and parking in this area should be removed. For this location, an advanced yield line could be added on both approaches to address the multiple-threat condition. For eastbound traffic, it should be placed the maximum 50 feet in advance of the crosswalk with adjacent "Yield Here" signage, along with the removal of one metered parking space. The advanced yield line for the westbound approach should be placed at the minimum recommended 20 feet from the crosswalk in order to also capture the southbound right turn lane from Santa Monica Boulevard.

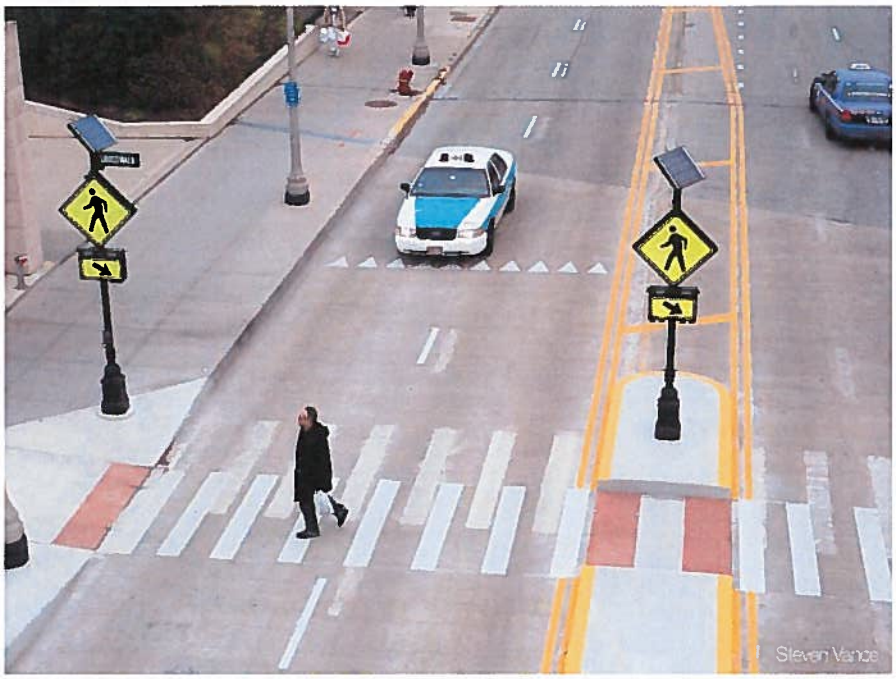


Figure 13. Advanced Yield Lines and Rectangular Rapid Flashing Beacons.

Traffic & Parking Commission Question: *Is the shark's teeth yield line enforceable?*

Answer: California Vehicle Code section 21461(a) includes a general provision that drivers must obey all regulatory signs and devices that are approved by the California Manual on Uniform Traffic Control Devices. As such, the shark's teeth yield lines are enforceable, because pavement markings are considered an official traffic control device. It is advisable, however, to accompany the markings with a "Yield Here to Pedestrians" regulatory sign to bring more attention of this legal requirement to motorists. The full California Vehicle Code paragraph reads as follows:

> ***Obedience by Driver to Official Traffic Control Devices***
> *21461. (a) It is unlawful for a driver of a vehicle to fail to obey a sign or signal defined as regulatory in the federal Manual on Uniform Traffic Control Devices, or a Department of Transportation approved supplement to that manual of a regulatory nature erected or maintained to enhance traffic safety and operations or to indicate and carry out the provisions of this code or a local traffic ordinance or resolution adopted pursuant to a local traffic ordinance, or to fail to obey a device erected or maintained by lawful authority of a public body or official.*

The corresponding sign is:

R1-5 Regulatory Sign

The crosswalk is bounded on the east side by a narrow raised median. Installation of a small raised median on the west side of the crosswalk could provide a full pedestrian refuge area in the event that a pedestrian is able to only cross one direction of travel at a time.

Rectangular rapid flashing beacons are user-actuated amber LEDs that supplement warning signs at unsignalized intersections or mid-block crosswalks. Rectangular rapid flashing beacons use an irregular "stutter" flash pattern similar to emergency flashers on police vehicles, and have been shown to significantly increase driver yielding behavior at crosswalks when supplementing standard crossing warning signs and markings. One Federal Highway Administration study showed them to also be significantly more effective than a traditional overhead beacon.

A rectangular rapid flashing beacon system would be appropriate for this location to bring to the motorists' attention the presence of a pedestrian. Separate beacons could be installed as follows: two in the new median to the immediate west of the crosswalk facing eastbound and westbound traffic, one on the right-hand side of each approach, and one in the pork chop island adjacent to and facing the southbound right turn lane from Santa Monica Boulevard. See Figure 13 for an example of rectangular rapid flashing beacons being used in conjunction with a raised median. The beacons can be activated by pedestrians manually by a push button or passively by a pedestrian detection system. If this option is selected, pedestrian-activated push buttons are recommended.

Truncated domes or tactile warning strips are brightly colored ground surface indicators to assist pedestrians who are blind or visually impaired detect the transition between the sidewalk and the street. The curb is the most reliable cue pedestrians with vision impairments use to identify this transition. Curb ramps which enhance access for wheelchair users create hazards for the visually impaired. A detectable warning at the bottom of the curb ramp can provide the information pedestrians with visual impairments need to safely cross the street. Modifications at this crosswalk should be accompanied by Americans with Disabilities Act upgrades, including curb ramp reconstruction to satisfy slope and clear space requirements, as well as 36-inch strips of detectable warnings at the bottom of the curb ramps.

Traffic & Parking Commission Question: *Examine possibility for additional improvements on South Santa Monica Boulevard between Lasky Drive and Wilshire Boulevard to address weaving issues and defacto third eastbound lane.*

Answer: One option that was considered is the construction of a curb extension (i.e., corner bulb out) on the southwest corner of South Santa Monica Boulevard/Lasky Drive to prevent motorists from using the parking lane as a defacto third eastbound lane. Given the acute angle of this intersection, however, this would make it difficult for most vehicles to complete a right turn at this corner. The improvement would need to be accompanied by a right-turn prohibition. Because left turns are not allowed from westbound South Santa Monica Boulevard onto Lasky Drive, this would essentially turn the portion of Lasky Drive between South Santa Monica Boulevard and Durant Drive into a one-way street northbound with the exception of southbound access at the mid-block driveways. Because this would significantly limit circulation and access in the area, a preferred alternative would be to paint a shoulder edge line and hatching to discourage the use of this space as a third travel lane.

WILSHIRE BOULEVARD & SOUTH PALM DRIVE

EXISTING CONDITIONS

The offset intersection of Palm Drive with Wilshire Boulevard is a side-street stop-controlled intersection located in the City of Beverly Hills between the signalized intersections at Rexford Drive and Doheny Drive. Wilshire Boulevard provides three peak-hour travel lanes for through traffic in both directions, and two travel lanes with parking on both sides of the road outside of the peak periods. Traffic on Wilshire Boulevard at this location is uncontrolled, and the speed limit is 25 miles per hour. The curb-to-curb width is 68 feet. At the intersection with South Palm Drive, pavement markings create a center median island dividing Wilshire Boulevard. The north and south legs of Palm Drive, which are stop-controlled, are offset from one another by approximately 100 feet.

A ladder crosswalk, which is considered a high visibility type, extends north to south across Wilshire Boulevard immediately to the west of the intersection with South Palm Drive. The pedestrian crossing distance across Wilshire Boulevard is 68 feet. Pedestrian visibility by approaching motorists is clear due to the straight, flat nature of the roadway at this location; however, it may be limited by other moving vehicles during times of heavy traffic flow. Existing red curb extends for 65 feet in advance of the eastbound approach and 32 feet in advance of the westbound approach.

In traffic counts collected on a Tuesday in March, 2016, more than 47,000 daily vehicle trips were recorded on Wilshire Boulevard, including almost 3,400 vehicle trips during the afternoon commute peak hour. Pedestrian volumes were collected during the typical pedestrian peak hour, which occurs in the middle of the day on a Saturday. Twenty pedestrians were observed using the crosswalk on Wilshire Boulevard during that time period, for an average of one pedestrian every three minutes. Due to the office-oriented land uses near the crosswalk, a higher number of pedestrians might be observed on a weekday.

A five year pedestrian- and bicycle-involved collision review revealed one collision near the intersection between January 2010 and December 2014, when a pedestrian was struck crossing in the unmarked crossing at the intersection with North Palm Drive (located 100' from South Palm Drive).

During the weekend peak hour, there were 20 pedestrians counted using this crossing. It is expected that activity is higher during the peak hour on a weekday given the adjacent office land use. Removing the marked crosswalk would likely result in pedestrians still crossing at this location or some other uncontrolled location nearby since the distance to either adjacent signalized crosswalk is about 600 feet. The additional walking distance to cross the street by using one of the adjacent controlled, marked crosswalks could be as much as one-quarter mile. It is unrealistic to expect that pedestrians would detour so far out of their way to utilize a controlled, marked crossing and legally pedestrians can cross at any location along Wilshire Boulevard between the signals at North Rexford Drive to the west and North Doheny Drive to the east. Because the crosswalk at South Palm Drive is located almost exactly halfway between the adjacent signalized intersections, it is a good location to channelize pedestrian activity. As such, strategies to increase vehicular-pedestrian separation and enhance motorist awareness were further explored for this location as well.

CROSSWALK TREATMENT OPTIONS

Best practice options for this location are illustrated on Figure 14 and described below. Pedestrian crossing improvements for this location were included in Metro's 2015 Call for Projects. As such, some grant funding has already been secured for use during the 2018-2020 fiscal year.

A PHB was also considered at this location but rejected as it would likely interfere with signal coordination along the heavily travelled Wilshire Boulevard.

The existing ladder crosswalk is considered a high visibility pattern. This could be switched out to a continental style or triple-four (see Figure 11), depending on the City's preference.

Currently, there are roadside pedestrian crosswalk warning signs for both approaches. The signage for the westbound approach includes a W54(CA) (pedestrian symbol with crosswalk lines) with a W16-7P (downward pointing arrow) beneath located on a street light before the crosswalk. To bring it to current standards, the top sign could be replaced with the W11-2 (pedestrian symbol without crosswalk lines). Also, both signs could be upgraded to fluorescent yellow-green for added conspicuity. There are also two advance warning signs, a W54(CA) with a "PED XING" plaque. Similarly, these could be replaced with W11-2 signs and an "AHEAD" plaque (W16-9P). The same upgrades could be implemented for the eastbound direction.

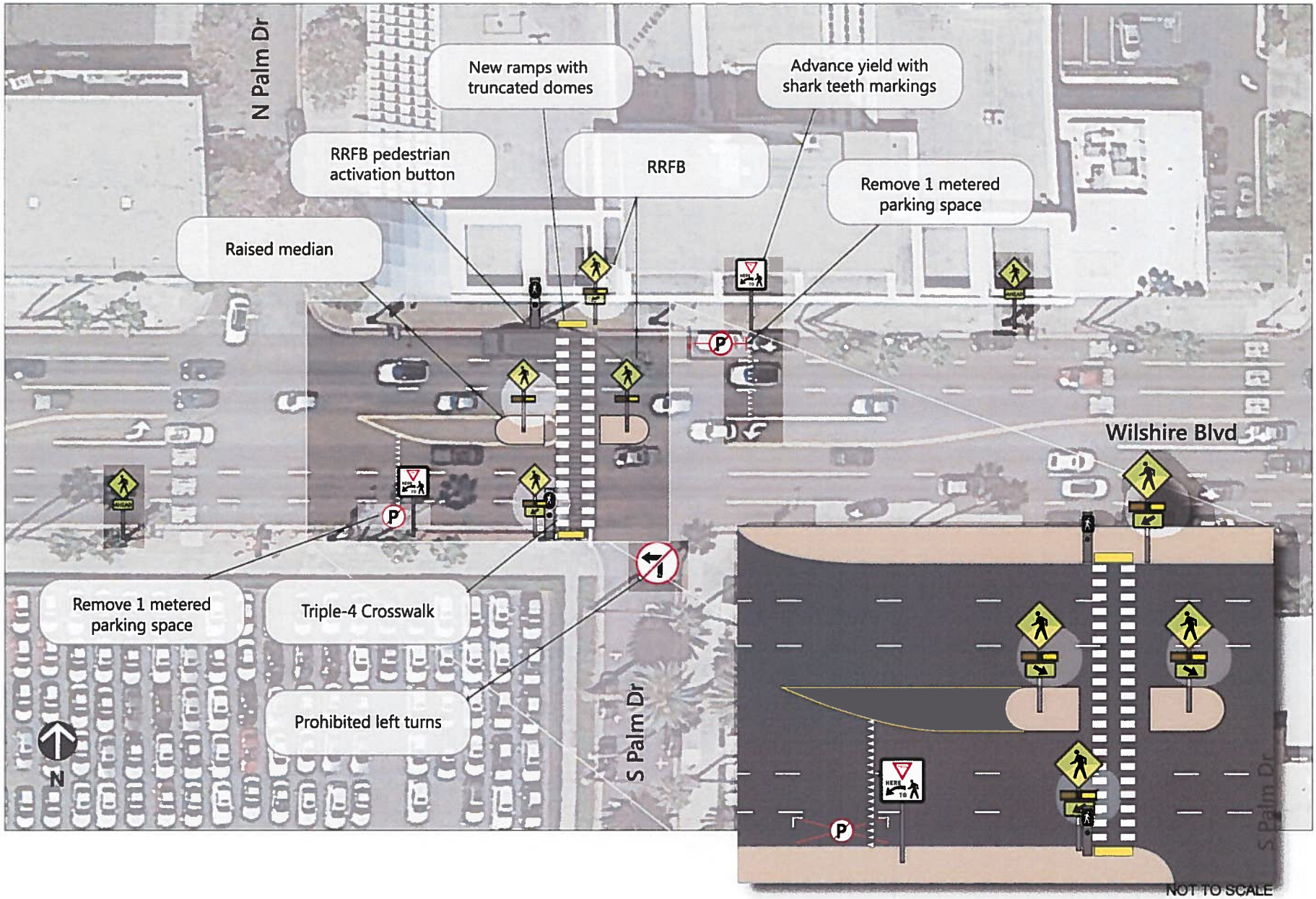
The multi-lane configuration creates the potential for multiple-threat crashes. This condition can be improved with the installation of advanced yield lines. If installed, it is recommended that they be placed the maximum 50 feet in advance of the crosswalk on both approaches, along with "Yield Here" signage. This would require the removal of a single metered parking space on both the eastbound and westbound approaches.

The crosswalk is bounded on the west side by a painted median. Installation of a raised median on both sides of the crosswalk could create a pedestrian refuge area in which pedestrians could wait if they are unable to find a suitable break in traffic in which to complete the entire crossing.

To alert motorists to the presence of pedestrians, a rectangular rapid flashing beacon system could be installed. If installed, four beacons are recommended at the following locations: on the north side of the road facing westbound traffic, two on new raised medians facing both directions of traffic, and one on the south side of the road facing eastbound traffic. If this option is selected, pedestrian-activated push buttons are recommended.

Modifications at this crosswalk should be accompanied by Americans with Disabilites Act upgrades, including curb ramp reconstruction to satisfy slope and clear space requirements, as well as 36-inch strips of detectable warnings at the bottom of the curb ramps.

A left-turn restriction from northbound South Palm Drive onto westbound Wilshire Boulevard could be analyzed and considered for implementation. These left turning vehicles must cross three travel lanes in order to complete the movement. Considering the heavy traffic volumes on Wilshire Boulevard, many drivers trying to make left turns may need to react and accelerate quickly to take advantage of small gaps in both directions of traffic. Drivers in this situation may not notice a pedestrian in the crosswalk, leading to potential conflicts. A left-turn restriction would remove this potential conflict.



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Wilshire Boulevard & Palm Drive Crossing

FIGURE 14

NORTH REXFORD DRIVE AND PARKING GARAGE

EXISTING CONDITIONS

The intersection of North Rexford Drive with the City Hall parking garage is three-way stop controlled. The intersection underwent reconstruction in 2014 to narrow the garage driveway by removing a circular feature. This modification also brought the two marked crosswalks across North Rexford Drive closer together. Each approach is controlled with a STOP sign and STOP pavement legend. While North Rexford Drive provides one lane in each direction, there is an additional left-turn lane on the southbound approach for access to the garage. Advance limit (stop) lines are provided for each approach set back 4' from the crosswalk to create separation between stopped motorists and pedestrians. In both the northbound and southbound directions, signs are provided at the second crossing (far side of intersection) notifying motorists to yield to pedestrians (Caltrans R1-5 signs). A fire station is located just south of the intersection on the west side of North Rexford Drive.

BEST PRACTICE OPTIONS

Our evaluation of this intersection did not include data collection but rather was limited to a site visit, review of existing traffic control and identification of enhancements, if any, that could help increase motorist compliance with stopping and yielding to pedestrians. During our field investigation, it was noted that a majority of trips traveling through the intersection are not associated with City Hall. Motorists appeared to be inpatient due to having to wait in the queue to pass through the intersection. While the majority of vehicles were observed coming to a complete stop and yielding to pedestrians, some were observed rolling through the stop and not properly yielding to pedestrians.

The CA MUTCD provides an option in Section 2B.12 to place In-Street Pedestrian Crossing signs (R1-6) at unsignalized pedestrian crosswalks to remind users of laws pertaining to right-of-way. When used, these signs are recommended to be placed in the roadway at the crosswalk location on the center line, on a lane line, or on a median island. Staff has already ordered the recommended in-street signs.