

A Fresh Look at Developing an Effective Complete Street Retrofit Plan

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Abstract. In the past, government agencies have focused on roadway capacity for motor vehicles when determining the roadway classifications to adequately provide for future growth and development. A recent, new concept is “Complete Streets”, which aims to adequately provide for not just motor vehicles, but for all forms of transportation within a street’s right-of-way, including pedestrians, cyclists, and equestrians. It has the further goal of making the shared right-of-way as safe as possible for each mode of transportation. This paper takes the Complete Streets concept a step further, to develop an implementation plan that is prioritized based on safety, coordination with other planned/proposed improvements, and linkages to other segments. The prioritization is based not on the need to widen a roadway or on the required funds, but rather, on the need for a segment to be improved based on safety considerations. It also takes into account other planned improvements to reduce costs by coordinating efforts. Finally, the improvements are prioritized based on linkages to other street segments, to maximize the effectiveness of the improvements. This method of determining how to implement a Complete Streets plan was developed while addressing conflicts between several transportation modes on Palos Verdes Drive East in the City of Rancho Palos Verdes, California. The multimodal, safety-related and planned improvements were incorporated together into a comprehensive, prioritized Complete Streets retrofit plan. The plan is currently being used for the City’s Capital Improvement Program and to obtain future grant funding for the identified improvements.

Introduction

The City of Rancho Palos Verdes, California, is a small community in southwest Los Angeles County, with a population of 41,000, and covering an area of approximately 14 square miles. The City is located on the Palos Verdes Peninsula, overlooking the Pacific Ocean. Most roadways are located in hillside canyons, on steep, uneven terrain. The City also has an extensive off-road trail system that serves equestrians, pedestrians and cyclists. The eastern section of Rancho Palos Verdes is served by Palos Verdes Drive East (PVDE), a narrow six-mile long two-lane roadway that provides access to several neighborhoods, schools and trails. The development along PVDE is primarily residential, with an elementary school, a middle school, a small private college, and a corner commercial area. PVDE carries approximately 12,000 vehicles per day (vpd) on a weekday and 10,000 vpd on a Saturday. In front of the schools, more than 130 pedestrians cross PVDE during the weekday school PM peak hour. Although no more than 14 cyclists per hour were observed on PVDE on a weekday, up to 150 cyclists per hour were observed on PVDE on a Saturday. Equestrians primarily use PVDE to access the off-road trails. The current conditions of PVDE are not conducive to equestrian use.

PVDE is a popular weekend spot for cyclists who enjoy the challenge of the roadway’s steep switchbacks. To better serve equestrians and pedestrians, and to help ease conflicts between motorists and cyclists, the City commissioned a multimodal corridor study for the six-mile length of PVDE. In addition to assessing the feasibility of widening PVDE to accommodate its multimodal needs, the study also identified key areas of interest having specific traffic-related

safety concerns. Initially, sections of PVDE were categorized based on the feasibility of multimodal improvements. Appropriate safety improvements were then developed for each key area of interest. Planned improvements to PVDE were also identified and prioritized using three significance criteria. The multimodal, safety-related and planned improvements were incorporated together into a comprehensive, prioritized Complete Streets retrofit plan. The plan is currently being used for the City's Capital Improvement Program and to obtain future grant funding for the identified improvements.

Multimodal Analysis

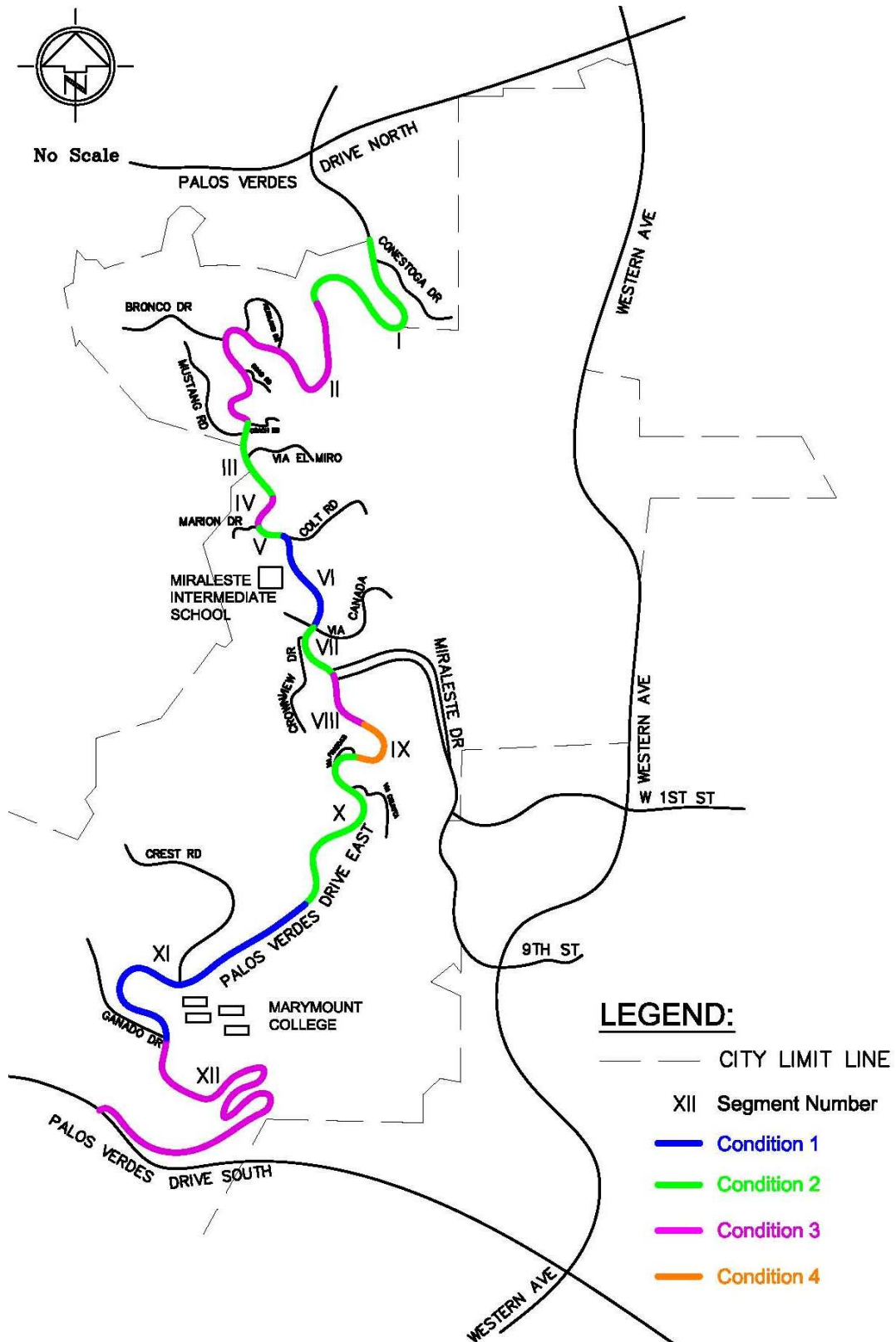
The paved width of PVDE ranges from approximately 28 feet to 74 feet, and the right-of-way (ROW) width varies from approximately 50 feet to 115 feet. For most of its length it has soft dirt or narrow asphalt shoulders, with no separate provisions for pedestrians, cyclists or equestrians. Based on City guidelines and the available right-of-way, minimum pavement and right-of-way widths were developed for the PVDE Complete Street, to provide one travel lane and one Class II bike lane in each direction, and sidewalks and equestrian trails on only one side of the street. The minimum recommended width of a travel lane for this roadway is 12 feet, the minimum bike lane width is 5 feet, the minimum sidewalk width/clearance is 5 feet, and the minimum tread width/horizontal clearance for an equestrian trail clearance is 4 feet/6 feet, resulting in a minimum pavement width of 34 feet and minimum ROW width of 45 feet with provisions for all modes of transportation.

For the multimodal analysis, street improvement plans, field reviews and GIS aerial maps were used to roughly identify each section of PVDE as being one of the four conditions listed below.

- Condition 1: The pavement appears to be wide enough to be restriped to provide bike lanes
- Condition 2: There appears to be enough available width to construct two bike lanes and a sidewalk, with minimal cut/fill
- Condition 3: The surrounding terrain is relatively steep, however, it may be feasible to widen the roadway to accommodate two bike lanes and a sidewalk
- Condition 4: Physical restrictions, such as steep terrain, appear to be too severe to make widening the roadway reasonable

Two sections of PVDE, totaling approximately one mile, were assessed to be Condition 1, where the street appears to be wide enough to stripe in a bike lane on each side of the street. Five sections of PVDE, totaling approximately one and one-half miles, are Condition 2, where there appears to be enough available width to construct two bike lanes and a sidewalk, with minimal cut/fill. Four sections of PVDE, totaling approximately three miles, are Condition 3, where the surrounding terrain is relatively steep, however, it may be feasible to widen the roadway to accommodate two bike lanes and a sidewalk. Only one section of PVDE, approximately one tenth of a mile long, is categorized as Condition 4, where physical restrictions, such as steep terrain, appear to be too severe to make widening the roadway to accommodate multimodal traffic reasonable. *Figure 1*, below, illustrates the locations of the each condition.

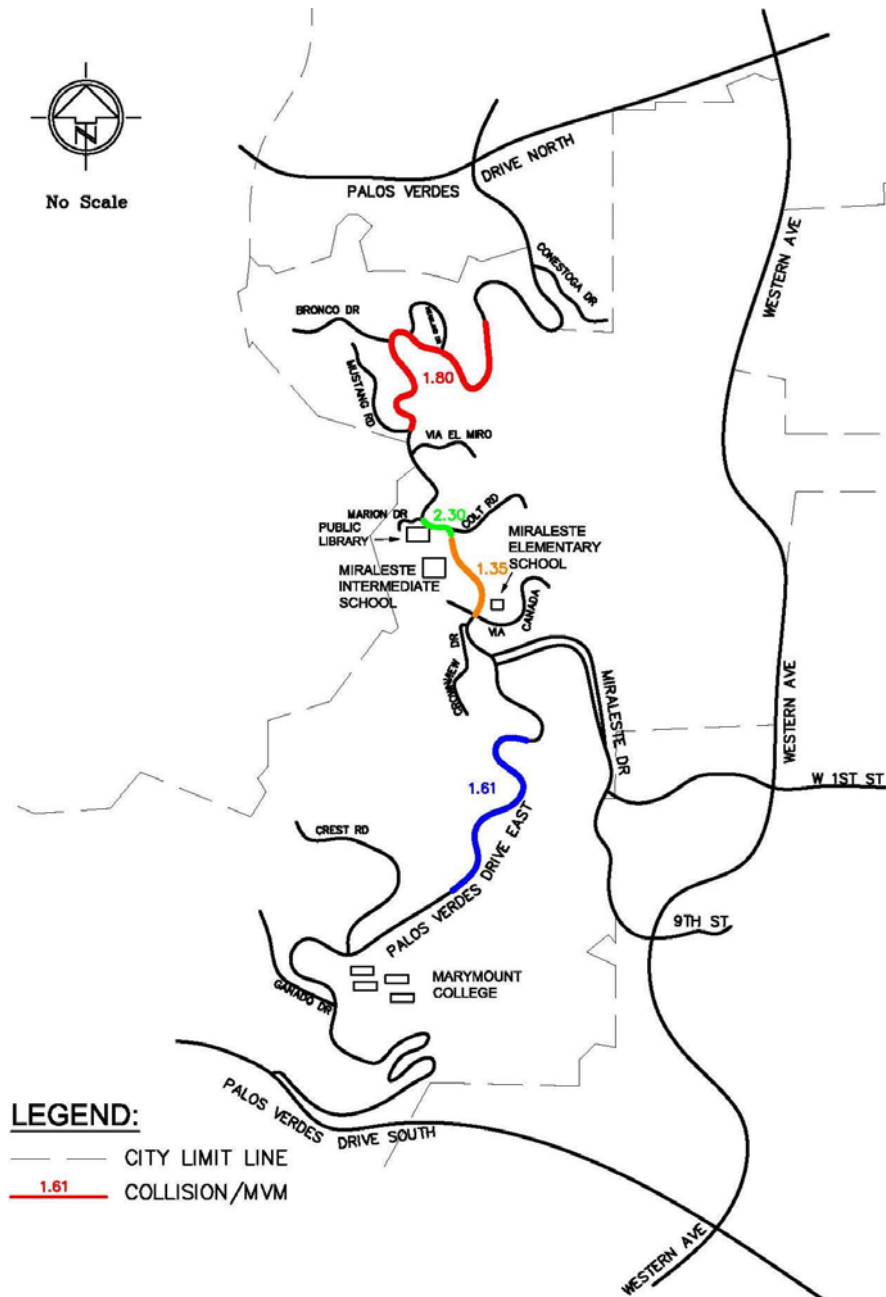
Figure 1. Categorization of Multimodal Segment Improvements



Traffic Collision Analysis

To assess the traffic safety of the various sections of PVDE, three recent years of traffic collision data was reviewed. There was a total of 75 reported collisions, with one involving a pedestrian and three involving bicyclists. The collision rates for two segments of PVDE exceeded the statewide average for similar streets of 1.65 Collisions per Million Vehicle Miles, which is indicative of a safety problem. *Figure 2* shows the four sections of PVDE with the highest collision rates, which indicates a greater need for safety improvements.

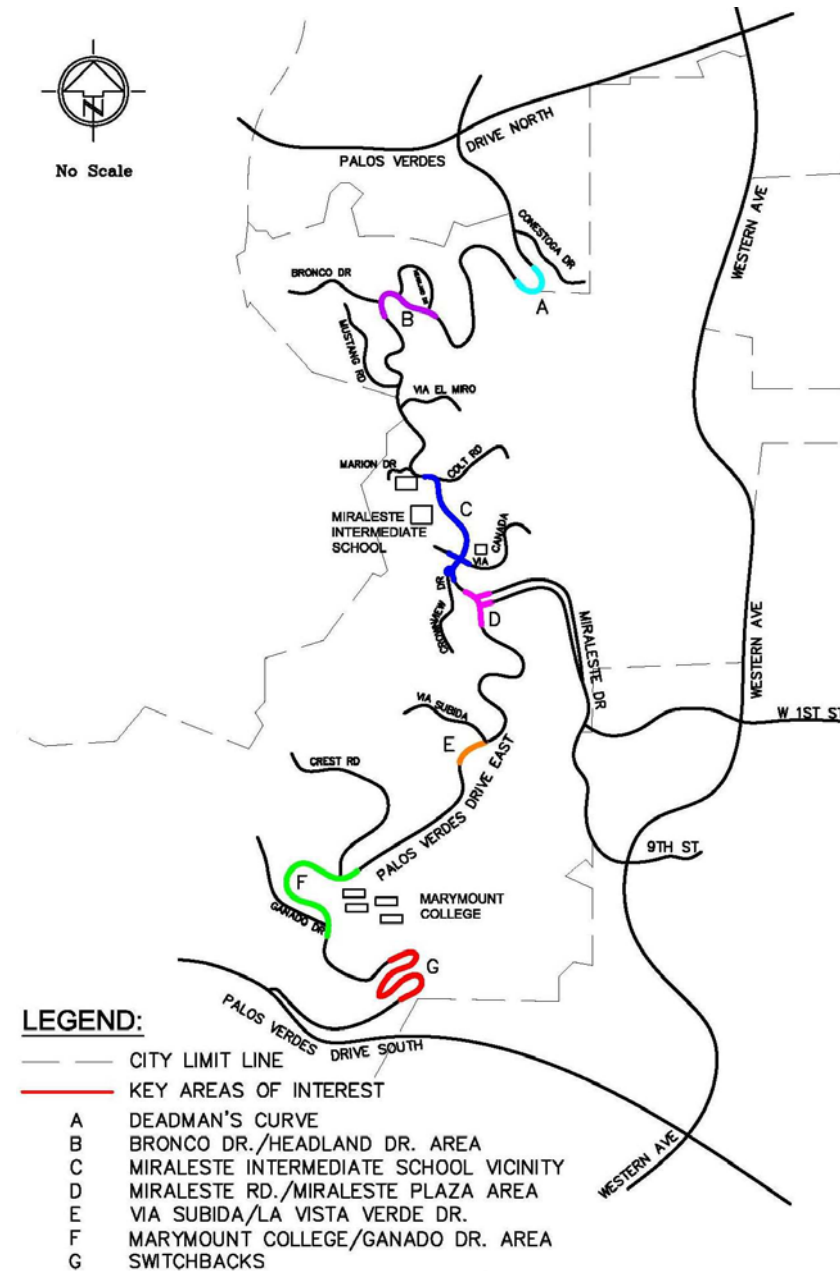
Figure 2. Segments of PVDE With High Traffic Collision Rates



Key Areas of Interest

In addition to the multi-modal improvements of Palos Verdes Drive East, specific traffic safety concerns were identified and are referred to as “Key Areas of Interest”. The Key Areas of Interest are identified and their locations shown on *Figure 3*.

Figure 3. Key Areas of Interest



At *Deadman's Curve*, the primary issue is that the heavily used equestrian trail is in poor condition and brush and overgrowth impede the safe passage of the equestrians. In the *Bronco Drive/Headland Drive* area, the primary concern is equestrian safety in crossing PVDE at *Bronco Drive*, which is located on a hairpin turn, with limited sight distance. Two schools and a library are clustered together in the *Miraleste Intermediate School* vicinity, with many school pedestrians crossing PVDE. There are no traffic controls on PVDE at the sprawling 5-legged intersection that serves the schools, and the terrain makes the crosswalks difficult to see. At nearby *Miraleste Drive/Miraleste Plaza*, many school children use the crosswalk on the east side of PVDE to cross *Miraleste Drive*, blocking traffic trying to turn from one roadway to the other. This results in a back-up of left-turning traffic on PVDE, which then blocks the through traffic. It is also

difficult for motorists to make left turns from *Miraleste Drive* onto PVDE. The heavy peak hour traffic on PVDE has a similar effect. Both *Via Subida and La Vista Verde Drive*, which are

located near each other, intersect PVDE at acute angles, making it difficult to see traffic approaching from the left on PVDE. A reported traffic collision has occurred at each of these two intersections during the last three years, which supports the safety concerns. The short four-lane section of PVDE in the *Marymount College/Ganado Drive* area causes motorists to speed up as the street widens from two lanes to four lanes, and then motorists have difficulty merging when PVDE narrows back down to two lanes. There is limited line of sight at the intersection of *Ganado Drive* and PVDE, due to the terrain in the area and the curve in the road. This safety issue is compounded by the many vehicles that pick up speed in this area due to *Ganado Drive* being the gateway to the *Switchbacks*. The *Switchbacks* are located in a steep section of PVDE, with narrow shoulders and no sidewalks or bike lanes. The roadway in this area is not wide enough to adequately accommodate both bicyclists and motorists.

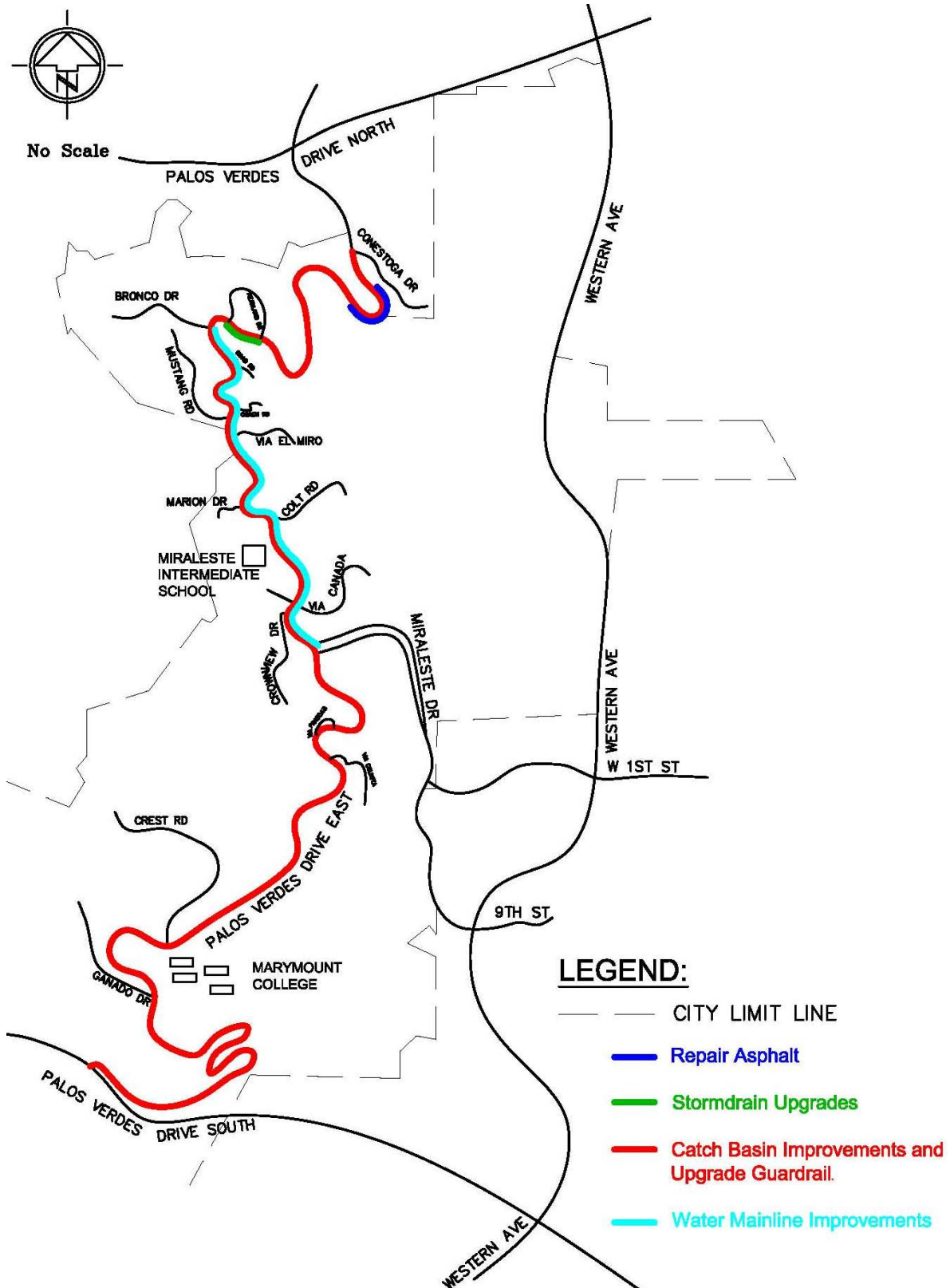
Feasible improvements for the Key Areas of Interest were developed to address the identified safety concerns. For *Deadman's Curve*, improvements that would increase equestrian safety include rehabilitation of the existing trail and brush clearance. In the *Bronco Drive/Headland Drive* area, widening the travel lanes, providing an equestrian/pedestrian trail behind a guardrail, and providing a high-visibility equestrian crossing at Bronco Drive would enhance safety. In the *Miraleste Intermediate School* area, school pedestrian safety would be improved by upgrading the crosswalks to high-visibility, providing wider sidewalks on both sides of PVDE and providing bike lanes. In the *Miraleste Drive/Miraleste Plaza* area, several different actions would improve safety, including installing a traffic signal at the intersection of PVDE and Miraleste Drive, widening PVDE to extend the existing southbound left turn lane, installing a roundabout (instead of a traffic signal), and installing sidewalks and bike lanes on both sides of PVDE.

Due to physical constraints, no feasible improvements are readily apparent for *Via Subida/La Vista Verde Drive*. A more comprehensive analysis is needed to identify appropriate and feasible improvements. In the *Marymount College/Ganado Drive* area, overall traffic safety would be improved by reducing PVDE from four lanes to two lanes and providing a two-way left turn lane and acceleration lanes, and installing bike lanes. In the *Switchback* area, bicyclist safety would be improved by upgrading the guardrails, improving the drain inlets and providing bike lanes. An interim improvement would be to install shared lane markings for bicycles, commonly called "sharrows". For narrow lanes without separate bike lanes, sharrows indicate to both motorists and bicyclists the portion of the lane bicyclists should use and are likely to occupy. Sharrows also encourage the safe passing of bicyclists by motorists and reduce the incidence of wrong-way bicycling.

Planned Corridor Improvements

Several separate improvements are planned for the PVDE corridor by both the City and other agencies. Implementing multimodal and safety improvements in conjunction with the planned improvements will reduce the cost to the City. The planned improvements include asphalt repair in the *Deadman's Curve* area, storm drain upgrades at *Headland Drive*, catch basin improvements from Palos Verdes Drive South to the North City Limit, water mainline improvements, including asphalt overlay, from *Miraleste Drive* to *Bronco Drive*, and upgrading the guardrails from *Conestoga Drive* to Palos Verdes Drive South. The planned corridor improvements are indicated on **Figure 4**, below.

Figure 4. Planned Corridor Improvements

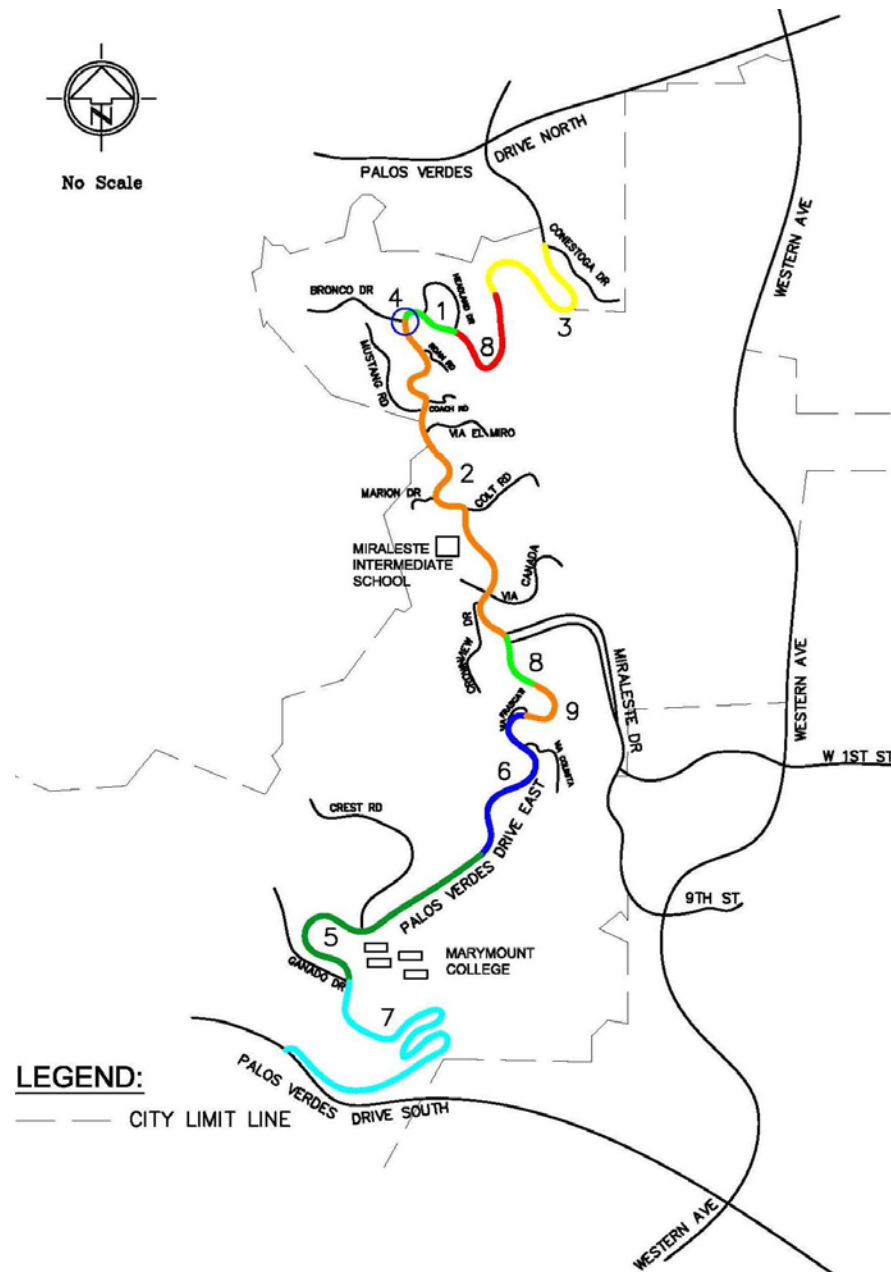


Integrated PVDE Corridor Improvements

The proposed multimodal and safety improvements were prioritized as shown in **Figure 5** and described in **Table 1**, based on the following considerations:

- #1 Safety
- #2 Coordination with other planned/proposed improvements
- #3 Linkages to other segments

Figure 5. Priority of Integrated PVDE Improvements



Based on safety considerations, the *Miraleste Intermediate School* and the *Bronco Drive/Headland Drive* areas were the most critical. These also coincided with the planned storm drain and water mainline improvements scheduled in the coming year. The segments in the *Miraleste Intermediate School* area are Conditions 1 and 2, which means the multimodal improvements would be relatively easy and inexpensive to install. The *Bronco Drive/Headland Drive* area is Condition 3 and multimodal improvements would be more expensive. Since it could be widened immediately, in conjunction with the initial planned improvement, this section was ranked first.

The intersection of PVDE/*Miraleste Drive* has several safety issues

Table 1. Priority of Integrated PVDE Improvements

PRIORITY	SECTION OF PVDE	PROPOSED ACTION
1	Headland Drive to Bronco Drive	<ul style="list-style-type: none"> Widen PVDE in conjunction with the storm drain upgrades to upgrade and/or provide an equestrian/pedestrian path and bike lanes
2	Bronco Drive to Miraleste Drive	<ul style="list-style-type: none"> Widen PVDE in conjunction with the water mainline improvements to provide sidewalks, equestrians paths, and bike lanes, as appropriate Install a high-visibility crosswalk at Via Cañada Study the intersection of PVDE and Miraleste Drive to determine appropriate improvements
3	Deadman’s Curve	<ul style="list-style-type: none"> Widen PVDE in conjunction with the asphalt repairs to provide/upgrade equestrian/pedestrian paths and bike lanes to the bend west of Horseshoe Lane
4	Intersection at Bronco Drive	<ul style="list-style-type: none"> Install a high visibility equestrian crossing when funding is available
5	Marymount College/Ganado Dr.	<ul style="list-style-type: none"> Conduct a study to determine the most appropriate improvements for the 4-lane segment from Ganado Drive to Calle Aventura and at the Ganado Drive/PVDE intersection.
6	Via Subida/La Vista Verde Dr. & Via Frascati to Diamonte Ln.	<ul style="list-style-type: none"> Widen to provide sidewalks and bike lanes, in conjunction with Marymount College/ Ganado Drive improvements or sooner, if feasible Study the intersections at Via Subida & La Vista Verde Dr. to determine actions that would improve visibility and access
7	Switchbacks	<ul style="list-style-type: none"> Narrow the travel lanes/widen the roadway to provide bike lanes, in conjunction with the catch basin and guardrail improvements, if possible
8	The bend west of Horseshoe Ln to Headland Dr. & Miraleste Dr. to south of Miraleste Dr.	<ul style="list-style-type: none"> To provide continuity, widen to provide sidewalks and bike lanes, in conjunction with improvements to the adjacent segments.
9	South of Miraleste Dr. to Via Frascati	<ul style="list-style-type: none"> Consider installing bicycle shared lane markings (sharrows).

and meets warrants for a traffic signal. Further study is needed, however, to determine the most appropriate actions for this Condition 2 location. Due to the close proximity of this intersection to the *Miraleste Intermediate School* area and large number of school pedestrians traversing through the intersection, it was linked to the *Miraleste Intermediate School* area under Priority 2. Although the *Marymount College/Ganado Drive* area had the third-highest collision rate, there are no specific planned improvements in this Condition 1 area. Since further study is needed to determine what improvements should be implemented to address the safety issues, other segments of PVDE were ranked higher than this Priority 5 location based on the combination of

conditions. Although the *Deadman's Curve* area did not have a high collision rate, the first planned improvements to PVDE are in this area. Since it may also be feasible to coordinate the multimodal and equestrian trail improvements with the planned improvements in this Condition 2 segment, *Deadman's Curve* was ranked third. The intersection of PVDE/Bronco Drive is located in the *Bronco Drive/Headland Drive* area, however, it was ranked separately, as Priority 4, since grant funding had been applied for and it was not as likely that the proposed improvements at this location would occur as soon as the planned improvements for other parts of the area. The *Via Subida/La Vista Verde Drive* area had the fifth highest collision rate due to collisions at the two acute-angle intersections. Although there are no readily apparent feasible improvements for these intersections, due to physical constraints, bike lanes and sidewalks could be constructed for the segment, which is Condition 2. It was ranked sixth, after adjacent *Marymount College/Ganado Drive*, with the idea that the sidewalk and bike lane improvements could be done in conjunction with the *Marymount College/Ganado Drive* multimodal improvements. Based on the three priority considerations, the *Switchbacks* area ranked lowest of any of the Key Areas of Interest, and was, therefore, ranked seventh, after the others.

Three other segments of PVDE, that are not in any of the Key Areas of Interest, are Conditions 2 or 3, and, therefore, feasible for multimodal improvements. They were combined together and ranked eighth, to be improved in conjunction with the adjacent Key Areas of Interest. A final segment, south of Miraleste Drive, is not within any Key Area of Interest, and is Condition 4, infeasible for multimodal purposes, due to very steep terrain. This segment was ranked last, at ninth, with the installation of sharrows at appropriate locations as the only proposed action.

This comprehensive, prioritized Complete Street retrofit plan is currently being used for the City's Capital Improvement Program and to successfully obtain grant funding for the identified improvements.

References

1. Smith, Ruth, Willdan Engineering, *Palos Verdes Drive East Preliminary Study Report*, Prepared for the City of Rancho Palos Verdes, California, January 2010.
2. National Complete Street Coalition. *An Ideal Complete Street Policy*, Downloaded from <http://www.completestreets.org/changing-policy/policy-elements/>.

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