

# MEMORANDUM

Date: August 19, 2016  
To: Kathy Small, City of Los Altos  
From: Fehr & Peers  
**Subject: Miramonte Avenue Path, Project CF-01006  
Alternative Concepts and Analysis Summary**

*SJ16-1667*

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This memorandum presents the alternatives evaluated for the incorporation of bicycle and pedestrian improvements on Miramonte Avenue in the City of Los Altos. The study corridor covers a length of approximately 0.8 mile (4,200 feet) between Covington Road and B Street, as shown in **Figure 1**. In 2012, this segment of Miramonte Avenue was identified in the City of Los Altos Capital Improvement Program (CIP) and City of Los Altos Bicycle Transportation Plan as the potential location of a new Class I bicycle path.

## **Figure 1: Project Location Map**

Given the implementation of new bicycle and pedestrian facilities on adjacent roadways since 2012, including recent upgrades to the intersection of Miramonte Avenue and Covington Road, it is appropriate to re-evaluate the most desirable treatment for Miramonte Avenue. This memorandum presents the following alternatives:

- A. Separated two-way bicycle pathway (Class I) north of Portland Avenue, buffered bicycle lanes (Class II) south of Portland Avenue
- B. Buffered bicycle lanes (Class II) throughout the length of the corridor
- C. Signed bicycle route with shared used lane markings for bicycles to use the vehicle travel lanes (Class III) throughout the length of the corridor

The goal of this project is to improve conditions for bicycles and pedestrians on Miramonte Avenue. The project will also enhance overall bicycle connectivity by improving the connection between existing Class II bicycle facilities on Fremont Avenue to the south and Miramonte Avenue



in City of Mountain View to the north. The project will add new pedestrian facilities along of Miramonte Avenue, closing many existing sidewalk gaps. Finally, it is anticipated that the project will be designed to minimize impacts to existing utilities and vegetation to the extent possible.

## EXISTING CONDITIONS

Miramonte Avenue, a major collector, is generally a two-lane roadway with a rural cross-section between Covington Road and B Street. North of Loraine Avenue, the roadway consists of two 10' lanes with shoulders varying between 2' and 8' in width. A southbound left-turn lane is provided at the all-way stop controlled tee intersection with Portland Avenue. All-way stop control is also utilized at the intersection of Miramonte Avenue and Covington Road.

The existing shoulders are frequently used by pedestrians and bicycles where available, though the asphalt pavement in the shoulders has significantly deteriorated in some locations. A short segment of separated path is provided on the west side of Miramonte Avenue in the vicinity of Clinton Road and Altos Oaks Drive, and a longer separated path/sidewalk is provided on the east side of the roadway roughly between Portland Avenue and Eastwood Drive.

A marked crosswalk is provided across Miramonte Avenue on the south side of Berry Avenue to connect a pedestrian path to the west with the separated path on the east side of Miramonte Avenue. Field observations indicate that many students walking between neighborhoods to the west along Berry Avenue and schools located to the east along Portland Avenue prefer to cross Miramonte Avenue utilizing the all-way stop at Portland Avenue rather than the less protected crossing at Berry Avenue. Recent bicycle and pedestrian counts indicate significant activity between Portland Avenue and Eastwood Drive in general.

No storm sewer drainage is present on this portion of the corridor, though retaining curbs are present in select locations, including the east side of the roadway between Manor Way and Berry Avenue where the right-of-way directly abuts Permanente Creek. This results in ponding conditions at some locations during significant rain events.

South of Loraine Avenue, Miramonte Avenue is approximately 40' wide with an urban cross-section consisting of a two-lane roadway, on-street parking in both directions, and curb-and-gutter on both sides of the roadway. A southbound right-turn lane is provided at B Street. This segment of roadway is characterized by many commercial driveways on both sides and typically sees a greater level of vehicle activity than the segment of the corridor north of Loraine Avenue.



The speed limit throughout the corridor is 25 miles per hour (mph) in both directions. The most recent available data on prevailing speeds indicates that the 85<sup>th</sup> percentile speed is 32 mph. Bicycle route signage and shared-use lane markings are provided intermittently, but are not provided with sufficient frequency to effectively delineate a continuous bicycle route.

The available right-of-way varies significantly throughout the corridor with a minimum width of 40' in some locations and a typical width as high as 70' on some segments. In many locations, significant right-of-way encroachment is present, including fences, property improvements, mailboxes, and vegetation maintained by property owners. Additionally, overhead utilities are present on both sides of the roadway throughout a majority of the corridor, resulting in several "pinch points" where the overall width of the paved surface (including shoulder) is reduced due to the presence of utility poles.

## BICYCLE FACILITY DESIGNATIONS

Bikeway planning and design in California typically relies on guidelines and design standards established by Caltrans in the Highway Design Manual (HDM)<sup>1</sup> Chapter 1000: Bikeway Planning and Design. Caltrans provides for four distinct types of bikeway facilities, as described below:

- *Class I Bikeway (Bike Path)* provides a completely separate right-of-way and is designated for the exclusive use of bicycles and pedestrians with vehicle and pedestrian cross-flow minimized. In general, bike paths serve corridors not served by streets and highways or where sufficient right-of-way exists to allow such facilities to be constructed away from the influence of parallel streets and numerous vehicle conflicts.
  - *Class II Bikeways (Bike Lanes)* are lanes for bicyclists adjacent to vehicle travel lanes. These lanes have special lane markings, pavement legends, and signage. Bike lanes are generally five feet wide. Adjacent vehicle parking and vehicle/pedestrian cross-flow are permitted.
  - *Class III Bikeway (Bike Route)* are designated by signs or pavement markings for shared use with pedestrians or motor vehicles, but have no separated bike right-of-way or lane striping. Bike routes serve either to: a) provide continuity to other bicycle facilities, or b) designate preferred routes through high demand corridors.
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- Class IV Bikeways (Protected Bike Lanes or Cycle Tracks) are lanes for the exclusive use of bicycles separated from the vehicle travel lane by a physical barrier such as grade separation, channelization devices, permanent barriers, or parked vehicles. These lanes have special lane markings, pavement legends, and signage. Bike lanes are generally five feet wide. Adjacent vehicle parking and vehicle/pedestrian cross-flow are permitted.

Though route signage and pavement markings are infrequent, Miramonte Avenue currently functions as a de facto Class III Bikeway providing connections between existing Class II bicycle facilities on Fremont Avenue to the south and Miramonte Avenue in City of Mountain View to the north.

## DESIGN ALTERNATIVES

The following design alternatives for new bicycle facilities were investigated:

- A. Separated two-way bicycle pathway (Class I) north of Portland Avenue, buffered bicycle lanes (Class II) south of Portland Avenue
- B. Buffered bicycle lanes (Class II) throughout the length of the corridor, with a short segment of separated one-way northbound cycle track (Class IV) between Portland Avenue and Eastwood Drive
- C. Signed bicycle route with shared used lane markings for bicycles to use the vehicle travel lanes (Class III) throughout the length of the corridor

All three alternatives would include the addition of pedestrian paths to close existing sidewalk gaps in the network.

### Alternative 1

This alternative consists of a two-way Class I bicycle and pedestrian path on the east side of Miramonte Avenue between Covington Road and Portland Avenue, with on-street Class II buffered bicycle lanes between Portland Avenue and B Street. Concept drawings prepared by Bellecci & Associates for Alternative 1 can be found attached in **Appendix A**.

The Class I path would consist of 4' lanes in each direction with 2' shoulders. The edge of the southbound pathway lane would generally be located 5' from the edge of the northbound vehicle lane on Miramonte Avenue. Vehicle lanes are approximately 11'-12' through this segment, with the curb-to-curb roadway cross-section reaching a maximum of 28' in some locations.



The Class I bikeway would be approximately 1,900' in length, and would require southbound bicycle traffic to transition across both directions of vehicle traffic on Miramonte Avenue at Covington Road to access the Class I bikeway and Portland Avenue to return to the proposed Class II bike lane.

The Class II bicycle lanes south of Portland Avenue would typically be 5' wide with a buffer of 2' in most locations. The buffer would be eliminated on some portions of the roadway south of Loraine Avenue, and on-street parking would also be provided outside the bicycle lane. Vehicle travel lanes south of Portland Avenue would be 10' in each direction for a majority of this segment.

South of Portland Avenue, new pedestrian paths would be provided on each side of Miramonte Avenue, likely utilizing a decomposed granite finish in most locations. Pedestrians on the east side of Miramonte Avenue north of Portland Avenue would utilize the shared Class I bikeway, while no pedestrian facility would be provided on the east side of Miramonte Avenue where the right-of-way abuts Permanente Creek between Portland Avenue and Manor Way.

### **Alternative 2**

This alternative consists of on-street Class II buffered bicycle lanes on the length of the corridor. Concept drawings prepared by Bellecci & Associates for Alternative 2 can be found attached in **Appendix B**.

The Class II bicycle lanes would typically be 5'-6' wide with a buffer of 2' in most locations. The buffer would be eliminated on some portions of the roadway south of Loraine Avenue, and on-street parking would also be provided outside the bicycle lane. Vehicle travel lanes would be 10' in each direction throughout the corridor. New pedestrian paths (5'-6' wide) would be provided on each side of Miramonte Avenue, likely utilizing a decomposed granite finish in most locations.

### **Alternative 3**

This alternative consists of a signed Class III bicycle route with shared used lane markings in both directions throughout the length of the corridor, and substantially represents the existing condition for cyclists. Concept drawings prepared by Bellecci & Associates for Alternative 3 can be found attached in **Appendix C**.



As is the case with all Class III bike routes, no dedicated bicycle facilities would be provided under this scenario. The existing roadway cross-section would largely be maintained in place, with additional signage and pavement marking treatments introduced to formalize the bike route.

A new pedestrian path would be provided on the west side of Miramonte Avenue throughout the length of the corridor, likely utilizing a decomposed granite finish. In this alternative, no new pedestrian facility is proposed to be provided on the east side of Miramonte Avenue.

### BICYCLE LEVEL OF TRAFFIC STRESS (LTS) AND STREETSCORE+

In order to determine the anticipated user comfort level with each of the proposed improvements, a bicycle Level of Traffic Stress (LTS) analysis was conducted for each of the alternative concepts. The inclusion of LTS allows the alternatives to be compared quantitatively in addition to qualitative design considerations.

#### **Methodology**

The LTS approach evaluates the level of comfort that a street provides for bicyclists. The original LTS methodology was published by the Mineta Institute in *Low-Stress Bicycling and Network Connectivity* (Mekuria, Furth, and Nixon, 2012). Fehr & Peers has adapted the LTS methodology into StreetScore+, a tool that evaluates pedestrian facilities as well as bicycle facilities using best practices from the *National Association of City Transportation Officials' (NACTO's) Urban Street Design Guide* and *NACTO Urban Bikeway Design Guide, 2nd edition*.

The Mineta Institute/StreetScore+ methodologies categorize facilities by how much stress people who walk and bike will tolerate in different environments:

- LTS 1: Most children can tolerate StreetScore+ 1 and feel safe while bicycling.
- LTS 2: This is the highest level of stress that the mainstream adult population will tolerate while still feeling safe.
- LTS 3: Bicyclists who are considered "enthused and confident" but still prefer having their own dedicated space for riding will tolerate this level of stress and feel safe while bicycling.
- LTS 4: For bicyclists, this is tolerated only by those characterized as "strong and fearless", which comprises a small percentage of the population. These roadways have high speed limits, multiple travel lanes, limited or non-existent bike lanes and signage, and large distances to cross at intersections.



The Mineta Institute and StreetScore+ methodologies differ for separated bikeways, such as cycle tracks. The Mineta Institute methodology assumes that all separated bikeways receive LTS 1, as these are considered separate facilities. However, separated bikeways can vary greatly in terms of level of protection afforded bicyclists and how protection from autos is treated at intersections. StreetScore+ incorporates the latest best practices in separated bikeway design from the *NACTO Urban Bikeway Design Guide, 2nd edition* to document the true comfort of these facilities from a best practice perspective. As a result, StreetScore+ typically shows poorer scores than the Mineta Institute methodology for separated bikeways that do not meet best practices for design. For bicycle lanes and bicycle routes, StreetScore+ utilizes the Mineta Institute methodology with no variations.

### Analysis

The Mineta Institute and StreetScore+ methodologies were used to evaluate the three previously discussed design alternatives for the segment of Miramonte Avenue between Portland Avenue and Covington Road:

- Alternative 1 - Class I: Two-way bicycle pathway on east side of street, 4' width in each direction, 2' raised buffer on each side (12' total width)
- Alternative 2 – Class II: Northbound and southbound directions each have a 5' bike lane and 2' painted buffer
- Alternative 3 – Class III bicycle route; no dedicated bicycle facilities (existing conditions)

Additionally, the two proposed design scenarios were evaluated for the segment of Miramonte Avenue between B Street and Portland Avenue:

- Alternative 1/2 – Class II: Northbound direction has 5' bike lane adjacent to a 8' parking lane south of Loraine Avenue, 5' bike lane with 1' minimum buffer north of Loraine Avenue; Southbound direction has 5' bike lane and 1' minimum buffer
- Alternative 3 – Class III bicycle route; no dedicated bicycle facilities (existing conditions)

The speed limit on Miramonte Avenue is set at 25 mph; however, the 85<sup>th</sup> percentile speed on the corridor is 32 mph. To present a conservative analysis of the potential for new facilities to reduce vehicle speeds, vehicle speeds under all alternatives were assumed to be 32 mph. Alternatives 1 and 2 would narrow vehicle lanes, however, which may reduce vehicle speeds along the corridor.

Analysis results are presented in **Table 1**. The table presents each alternative, the scores it received using the StreetScore+ methodology (to account for best practices in cycle track and pathway design), and key factors which lead to the score.



TABLE 1: STREETSCORE+ LEVEL OF TRAFFIC STRESS ANALYSIS RESULTS					
Portland Avenue to Covington Road					
Alternative		NB Facilities	SB Facilities	Key Scoring Factors	StreetScore+
1	Class I	Two-way bicycle pathway with 8' two-way width, 2' shoulder on each side (12' total width)		Narrow path & buffer (recommended: 6' track per direction, 4' buffer); poor visibility at side streets	4
2	Class II	5' bike lane and 2' painted buffer		85 <sup>th</sup> percentile speed at 32 mph	3
3	Class III (Existing)	No dedicated bicycle facilities		Absence of separated bicycle facilities; 85 <sup>th</sup> percentile speed at 32 mph	4
B Street to Portland Avenue					
Alternative		NB Facilities	SB Facilities	Key Scoring Factors	StreetScore+
1 & 2	Class II	5' bike lane and 2' painted buffer (north of Lorraine) 5' bike lane, no buffer, adjacent 8' parking lane (south of Lorraine)	5' bike lane and 1'-2' painted buffer	Narrow shared parking/bike lane width; 85 <sup>th</sup> percentile speed at 32 mph	3
3	Class III (Existing)	No dedicated bicycle facilities		Absence of separated bicycle facilities; 85 <sup>th</sup> percentile speed at 32 mph	4

Source: Fehr & Peers, 2016.



## Results

With a StreetScore of LTS 3, Alternative 2 provides a better result than either Alternative 1 or Alternative 3, both of which yield an LTS 4. As shown by the StreetScore+ methodology, limited right-of-way and poor sight distances along the corridor limit the effectiveness of the Class I facility as an intervention. The Class I pathway design evaluated in Alternative 1 provides only 4' of track width for each direction of travel, rather than the 6' recommended by NACTO.

## CONCLUSIONS

Overall, it appears that each of the three alternatives identified is feasible from a design standpoint. **Table 2** presents the a summary of overall trade-offs in terms of comfort, design, and cost for bicyclists and pedestrians resulting from each alternative.



TABLE 2: TRADE-OFFS BETWEEN CONCEPT ALTERNATIVES			
Consideration	Alternative 1	Alternative 2	Alternative 3
	<ul style="list-style-type: none"> <li>• Walkway improvements on both sides of roadway</li> <li>• Pedestrians interact with bicyclists on Class I path</li> <li>• Narrow two-way shared space may increase conflicts</li> </ul>	<ul style="list-style-type: none"> <li>• Walkway improvements on both sides of roadway</li> </ul>	<ul style="list-style-type: none"> <li>• No new sidewalk facilities on east side of roadway, decreased improvement in pedestrian connectivity</li> </ul>
	<ul style="list-style-type: none"> <li>• Improved comfort for bicyclists, but space shared with pedestrians on Class I path</li> <li>• Narrow two-way shared path, location on only one side of street may be less convenient</li> <li>• Relatively short Class I segment may cause southbound bicyclists to avoid use due to difficulty of transitions</li> <li>• Greater conflict potential at driveways and minor intersections</li> </ul>	<ul style="list-style-type: none"> <li>• Highest level of comfort for bicyclists</li> <li>• Provides most consistent bicycle treatment throughout corridor</li> <li>• Avoids need for transitions across vehicle traffic for continuous travel in southbound direction</li> </ul>	<ul style="list-style-type: none"> <li>• Improvement for bicyclists primarily restricted to wayfinding</li> <li>• Substantially maintains existing condition for bicyclists utilizing the vehicle lane</li> </ul>
	<ul style="list-style-type: none"> <li>• Highest cost</li> <li>• Greatest impact to existing vegetation, including removal of 36 mature trees</li> <li>• Increased cost for utility removals/relocations</li> <li>• May require reversing existing right-of-way encroachment, creating potential barrier to implementation</li> </ul>	<ul style="list-style-type: none"> <li>• Intermediate Cost</li> <li>• Minimizes impact to vegetation and utilities while still providing similar bicycle and pedestrian improvements as Alternative 1</li> <li>• Relatively few barriers to implementation</li> </ul>	<ul style="list-style-type: none"> <li>• Lowest cost</li> <li>• Lowest impact to vegetation and utilities</li> <li>• Comparatively little benefit compared to existing condition for costs incurred</li> </ul>

Source: Fehr & Peers, 2016.



As can be seen, Alternative 3 results in substantially fewer benefits to both bicycle and pedestrian users. By not providing dedicated bicycle facilities and sidewalks on the east side of Miramonte Avenue, it would fail to satisfy the project goals.

Alternatives 1 and 2 both result in comparable improvements to bicycle and pedestrian facilities, with Alternative 2 providing the most consistent bicycle user experience and greatest level of comfort according to the StreetScore+ methodology. Alternative 2 also has significantly fewer impacts to existing utilities and vegetation, resulting in lower anticipated construction costs and greater consistency with the overall project goals.

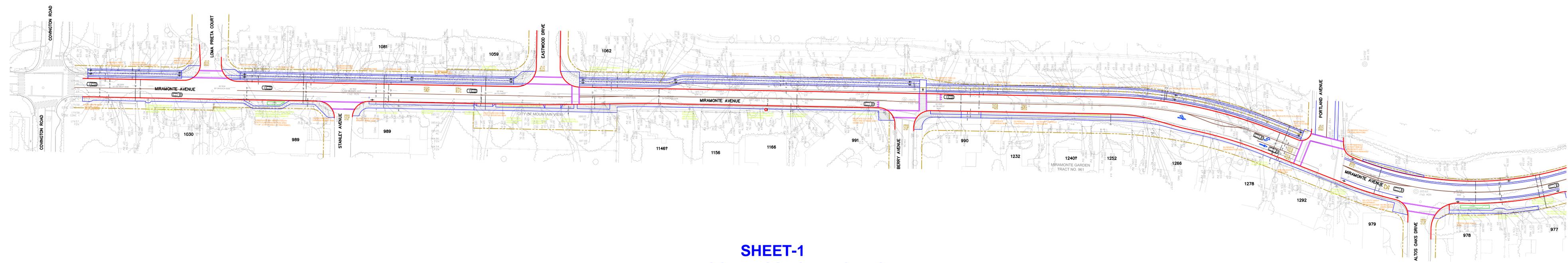
As a result, we recommend that the City proceed with Alternative 2 to provide buffered bicycle lanes throughout the length of the Miramonte Avenue corridor.



## **APPENDIX A: ALTERNATIVE 1 CONCEPT LAYOUT**

**EXHIBIT - MIRAMONTE AVENUE CLASS I BIKE LANE IMPROVEMENTS  
CITY OF LOS ALTOS**

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**SCALE: 1"=40'**

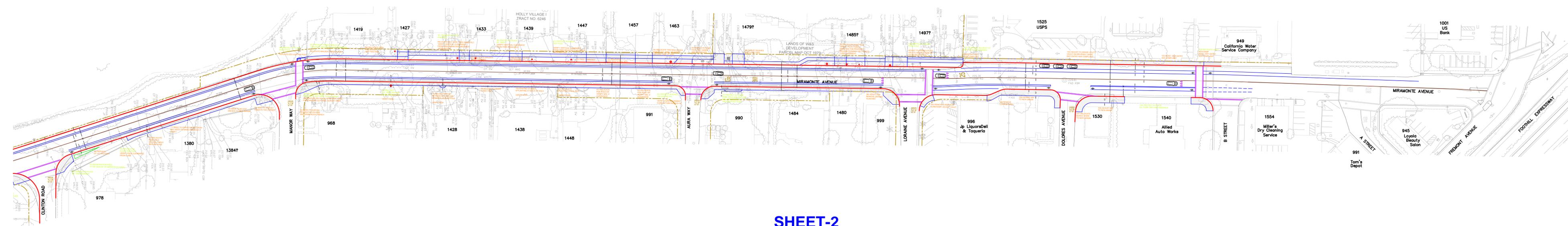


**SHEET-1  
BELLECCI & ASSOCIATES, INC.  
JUNE 2, 2016**



SCALE: 1"=40'

# EXHIBIT - MIRAMONTE AVENUE CLASS I BIKE LANE IMPROVEMENTS CITY OF LOS ALTOS



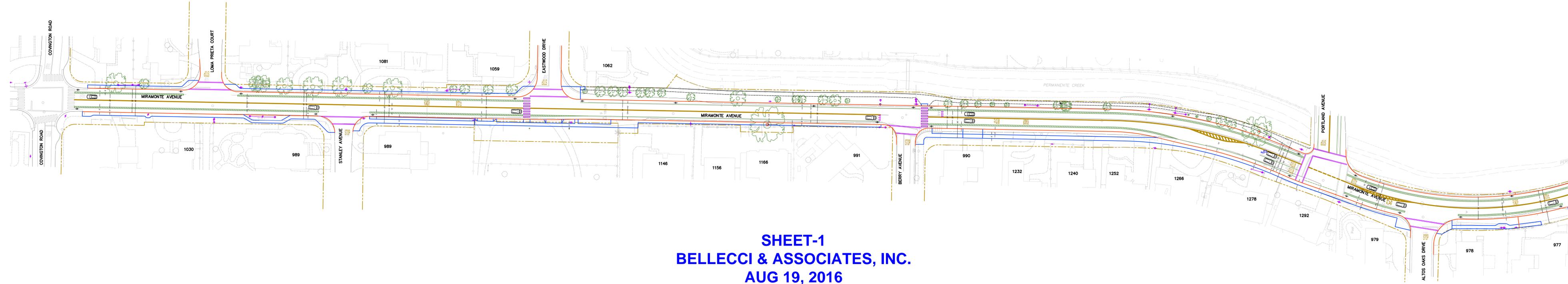
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**BELLECCI & ASSOCIATES, INC.**  
**JUNE 2, 2016**



## **APPENDIX B: ALTERNATIVE 2 CONCEPT LAYOUT**

**EXHIBIT - MIRAMONTE AVENUE CLASS II BIKE LANE  
IMPROVEMENTS  
CITY OF LOS ALTOS**

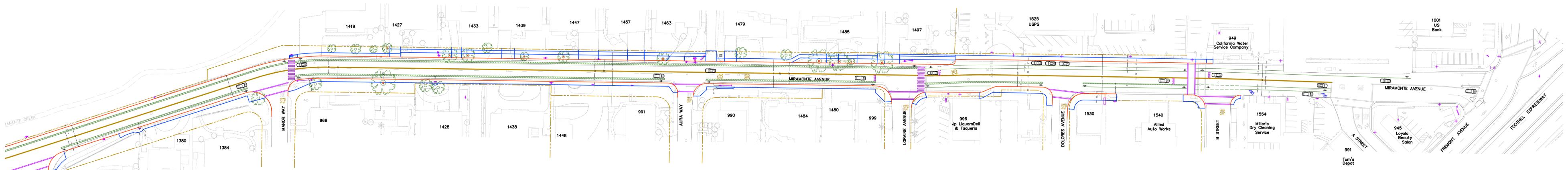
  
**SCALE: 1"=40'**





SCALE: 1"=40'

**EXHIBIT - MIRAMONTE AVENUE CLASS II BIKE LANE  
IMPROVEMENTS  
CITY OF LOS ALTOS**



**SHEET-2  
BELLECCI & ASSOCIATES, INC.  
AUG 19, 2016**

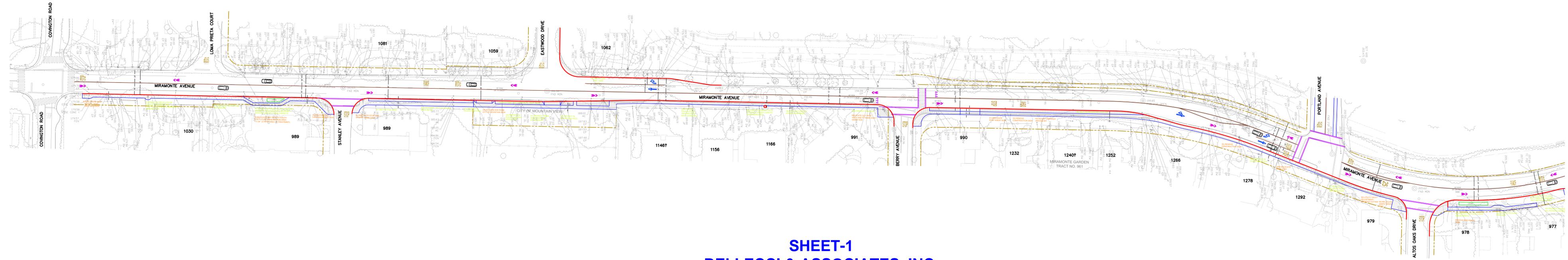


## **APPENDIX C: ALTERNATIVE 3 CONCEPT LAYOUT**



SCALE: 1"=40'

# EXHIBIT - MIRAMONTE AVENUE CLASS III BIKE LANE IMPROVEMENTS CITY OF LOS ALTOS



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JUNE 3, 2016

