



Silver Avenue Bike Boulevard Study

Prepared for
City of Albuquerque City Council



February 22, 2016

Prepared by
Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

INTRODUCTION

Silver Avenue between Yale Boulevard and San Mateo Drive, in City Council District 6, accommodates a wide range of users. In addition to motor vehicle traffic, Silver is heavily used by pedestrians, bicyclists, and skateboarders, and is designated by the City of Albuquerque as a bicycle boulevard. Recent development, such as the Brick Light District and small shops and multi-family complexes in the Nob Hill area, has increased the traffic and demand for parking on Silver, and there are concerns that the increased conflicts between motorized and non-motorized users may be diminishing safety along the corridor. Additionally, plans for the Albuquerque bus rapid transit project (ART) on Central Avenue, the parallel facility one block north, may have effects to traffic on Silver. This report summarizes a study of these issues on Silver Avenue between Yale and San Mateo. To best balance the competing demands along Silver, City Councilor Rey Garduño authorized a study to prepare recommendations on how to best operate the roadway for multiple types of users.

EXISTING CONDITIONS REVIEW

Information about the existing conditions along Silver Avenue was gathered through several methods: anecdotal information shared by members of the community, a field review and video survey of the Silver Avenue corridor, a summary of crash reports from incidents along the corridor, and a review of existing documents that include Silver Avenue and the City of Albuquerque's bike boulevard program.

Steering Committee Kick-off Meeting

By request of the City Councilor, a Steering Committee was formed for this project, which included members of the University Heights Neighborhood Association, Nob Hill Main Street, a consultant representative from the ART project, and staff from the City's Department of Municipal Development (DMD), Department of Planning, City Council, and ABQ Ride (transit). Issues of concern along Silver that were brought up at the kick-off meeting with this group are listed here.

- It was pointed out that there has been a bicyclist fatality in the study area in the past eight months.
- Don Hancock briefly summarized a meeting held in November 2014 that initiated this project. Some of the concerns along the corridor that were brought up at that meeting were:
 - Alleys in the area are operating as streets but without traffic control (i.e., stop signs). In some places (the PNM building for instance) there is a sight distance problem for pedestrians on the sidewalk.
 - On-street parking is an issue throughout the corridor. It is unclear where parking is allowed and where it is prohibited.
 - Stop sign consistency is an issue. Stop signs are not recommended for traffic along a bike boulevard. Can yield signs be considered?
 - Silver's daily traffic volume is too high for a bike boulevard.
 - HDR is doing a traffic simulation to determine the effects of the BRT along Central. It is expected they will have the results from that by August 2015. The steering committee members were unsure whether Silver was being modeled as part of that effort.
 - Silver Avenue is classified as a local street. It should not be expected to handle overflow traffic from Central.

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- There are many skateboarders who use Silver. They ride all over the street, and sometimes on the sidewalks.
 - The intersection of Silver and Solano is tricky for bicyclists.
 - There is a large building under construction – 78 units – that will use Silver for on-street parking. It is part of the Nob Hill sector plan.
 - The Silver/Harvard intersection is tricky.
 - When Popejoy Hall has events there is a high demand for on-street parking. Many of the permit parking spaces are open to anyone after 5 pm.
 - Columbia is the first north-south street east of Yale to continue south past the cemetery. There is speeding on this street.

Silver Avenue Walking Survey

A walking survey of the corridor took place on May 6, 2015, and began at the intersection of Silver/Yale. Photos from the survey are included in Appendix A. The attendees walked east to San Mateo. Prior to the walking survey, a videorecording of the corridor was made both eastbound and westbound along Silver, at about 5:00 pm on Monday, May 4, 2015. The following are observations from the walking survey and videorecording.

- All signs along the corridor should be reviewed (especially speed limit and bike boulevard).
- Yale and Silver: needs better marking of where to go to continue on bike boulevard. A bollard exists in the middle of the west-side ramp across Yale, making it look like maybe it's not the place for bikes to go.
- Speed limit sign needed going eastbound just east of Yale.
- Patrons of the Brick Light District use Silver to access Harvard.
- We need to maintain consistency in the bicyclists' path within the cross section of Silver.
- The wall of the PNM building on the north side between Harvard and Cornell blocks the view of pedestrians on the sidewalk from what's approaching southbound on the alley. Would signing and marking, mirrors help?
- Cornell is a busy traffic street because of the post office, Saggio's, Frontier. Silver/Cornell intersection has four-way stop.
- Students often don't realize the inconsistency in stop signs.
- Traffic diverters (bike-permeable) may be acceptable in the area
- The new BRT down Central may divert traffic to Silver. It will change traffic patterns due to the new turn restrictions on Central.
- Near Silver, the alley between Cornell and Stanford is actually paved and striped to be two-lane/two-directional. It leads to Frontier.
- Stanford is residential but is also the vehicle entrance into the UNM campus.
- Vehicles travel at high speeds northbound and southbound on Stanford.
- The City's yellow painting of the curb prohibits parking. Inconsistent though.
- Two passersby mentioned that if Silver is really a bike boulevard it should a straight shot for bicyclists – not as many stop signs.
- From Stanford to Columbia it is unclear whether parking is allowed.

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- Columbia from Silver to Central is very dense student housing. The alley between these streets is mainly used by residents of the adjacent housing.
 - Columbia is the first north-south street east of Yale that continues past the cemetery. Sometimes used as an alternative to Girard.
 - The next alley, between Princeton and Columbia, has good visibility, and is mostly used by residents.
 - Silver/Princeton intersection is a four-way stop but only the eastbound and northbound stop signs are accompanied by “ALL WAY” placards.
 - Street lighting is inconsistent. Alleys should be lighted for security reasons.
 - Starting east of Princeton, Silver has parking on both sides of the road.
 - There is a draft study by the City available that includes recommendations for the Girard and Silver intersection.
 - The first 18 mph speed limit we saw was westbound just west of Girard.
 - Girard is used as a bike route. May have official bike designation (check).
 - The business owners in Nob Hill need to be involved in this study.
 - The curbs on Girard (chokers) at Silver affect bikes negatively.
 - East of Girard there is parking on both sides of Silver.
 - West of Dartmouth there may be another sight distance issue for pedestrian at the alley.
 - The Silver/Dartmouth intersection does not have wheelchair ramps at any of the four corners.
 - The Silver/Richmond intersection is a four-way stop. It has curb ramps, and all of the stop signs have “All Way” placards.
 - There aren’t many crosswalks along Silver. There is one across the north leg of Richmond.
 - There is an 18 mph sign eastbound east of Richmond.
 - It was pointed out that near the 12th Street/Mountain intersection there is some special signing to warn motorists of bicyclists.
 - The alley east of Richmond may have a sight distance issue for pedestrians.
 - The day care at the northeast corner of Silver/Richmond has a School Xing warning sign for westbound traffic on Silver. Not sure that’s the appropriate use for that sign.
 - Residents question whether the two-hour parking restriction is being enforced in the Nob Hill area.
 - Because of the inconsistency of stop signs, sometimes drivers stop even when there is no stop sign for their approach.
 - The plan is for a BRT station at Bryn Mawr and Central.
 - There may be locations where driveways onto Silver should be closed.
 - An attendee of the walk suggested making Silver one-way.
 - The Bryn Mawr area has a lot of on-street parking being used.
 - The Central/Wellesley intersection is signalized.
 - Around Nob Hill Silver is a little wider, more feasible to put parking on both sides of the street.
 - There is a four-way stop at Amherst. All stop signs have “4 WAY” placards. There are crosswalks on all four legs – a lot of pedestrian use between Nob Hill and parking.
 - Green curb painting is used by the City to denote loading zones.
 - Ken Mitchell at the City is testing a parking space app. His number is (505) 228-5236.
 - Big jog at Carlisle between Silver approaches. Southbound Carlisle is uphill.

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- East of Carlisle appears comfortable for a bike rider but it is not signed or marked well as a bike boulevard.
 - Northbound Hermosa traffic is really fast across Silver. (Silver traffic has stop signs.)
 - The Silver/Solano/Arlote intersection creates a weird triangle (not curbed). A little unclear whether bicyclists proceed on Silver or turn on Arlote. Westbound traffic on Arlote conflicts with eastbound Silver bike boulevard traffic.
 - There are three intersections – Solano, Hermosa, Aliso where Silver traffic has stop signs – three blocks in a row. Not good for bicyclists who have to work their momentum back up.
 - There is a bike boulevard wayfinding sign for westbound traffic west of Morningside.
 - The traffic diverter at Silver/Morningside is similar to the one at Yale – not clear or conducive to bike use. Appears designed so that westbound bicyclists ride to the right of the island, but riding to the left is easier and more direct.
 - East of Morningside more use of on-street parking on Silver.
 - There used to be a diagonal diverter at Silver and Montclair (installed in the 2000s to deter drug activity, as I recall). It was not bike-permeable.
 - Where the bike boulevard diverts to Mesa Grande at Graceland the signing and pavement marking for that diversion is not very clear.
 - The Mesa Grande/Graceland intersection has stop signs for the southbound Graceland approach (the bike boulevard approach). There also used to be a diagonal diverter here in the 2000s.
 - Where the bike boulevard crosses Washington from Mesa Grande to Silver – seems like a good place for a bike refuge.
 - East of Washington Silver has a center stripe (not recommended for bike boulevards). Parking is allowed on both sides of Silver in this stretch but there is not much demand for parking here most times.
 - The Hiland Theater is near this area.
 - Few signs for the bike boulevard east of Washington.
 - What does the bike boulevard connect to at San Mateo?
 - The Silver/Monroe intersection has an all-way stop.

Speed Data

Speed data was collected using pneumatic tubes at three locations along the Silver Avenue corridor. The three locations were chosen because they were the places where the distance between the stop signs was the longest, and it was thought the highest speeds would be observed. Speed data was collected for a three-day period from Tuesday, May 5, 2015 through Thursday, May 7, 2015. The three locations were Silver east of Quincy, Silver west of Graceland, and Silver west of Tulane. The posted speed limit at all three locations is 18 mph. The data are summarized in Table 1. The 85th percentile speed is generally considered to be the speed that most closely conforms to a speed limit which is considered “safe and reasonable” for motorists. All data that was collected is included in Appendix B.

While the tube data shows that speeds in excess of 75 mph were recorded on Silver, the traffic counting consultant stated that these recordings were most likely the result of bicyclists on the sidewalk. Tubes are more sensitive near the counters. Because the counters were on the sidewalks, bicyclists riding on the sidewalks might have been counted, and the close spacing of their tubes on the sidewalk would result

in a high speed reading. The consultant did not feel that any of the outlying speeds were accurate motor vehicle speed readings.

Table 1. Speed Data Collected on Silver Avenue, May 5-7, 2015

Location	Eastbound Average Speed	Eastbound 85 th Percentile Speed	Westbound Average Speed	Westbound 85 th Percentile Speed
West of Tulane	15 mph	24 mph	15 mph	24 mph
West of Graceland	17 mph	26 mph	17 mph	25 mph
East of Quincy	21 mph	28 mph	20 mph	28 mph

Parking Study

A survey of parking spaces was conducted on Thursday, April 16, 2015. Figure 1 shows the summary.

Parking along Silver includes free on-street parking both limited and with no limit, limited-duration metered parking, and permit-only parking. All parking along the Silver corridor is parallel. From Yale to Tulane parking is used by students, residents, and patrons to shops and restaurants in the area. Between Tulane and Carlisle it is mostly used by patrons to shops and restaurants in Nob Hill. Between Carlisle and Washington on-street parking is used mostly by residents. On-street parking spaces are usually available at most times between Washington and San Mateo.

The designation of on-street parking along Silver is inconsistent in signing and curb painting. In some places it is unclear where parking is and is not allowed. Some locations show that parking is prohibited with a sign, some show it is prohibited by yellow curb paint, and some show both.

Volume Data

Traffic volume data was collected using pneumatic tubes at three locations along the Silver Avenue corridor. Data was collected for a three-day period from Tuesday, May 5, 2015 through Thursday, May 7, 2015. The three locations were Silver east of Quincy, Silver west of Graceland, and Silver west of Tulane. The data are included in Appendix C and summarized in Table 2.

Table 2. Traffic Volume Data Collected on Silver Avenue, May 5-7, 2015

Location	Average Eastbound Daily Traffic Volume	Average Westbound Daily Traffic Volume	Average Two-Way Daily Traffic Volume	Peak Hour Eastbound	Peak Hour Westbound
West of Tulane	919 vpd	1,055 vpd	1,974 vpd	105 vph (4:00 to 5:00 pm)	105 vph (2:30 to 3:30 pm)
West of Graceland	233 vpd	285 vpd	518 vpd	30 vph (12:00 to 1:00 pm)	37 vph (12:30 to 1:30 pm)
East of Quincy	1,057 vpd	1,266 vpd	2,323 vpd	154 vph (1:45 to 2:45 pm)	155 vph (7:00 to 8:00 am)

Turning Movement Counts

Turning movement counts were collected; they are included in Appendix D and summarized in Figure 2. The counts were collected at the cross streets listed below between May 5 and May 7, 2015. At that point in the University of New Mexico (UNM) school calendar, some classes had already finished for the semester, so the counts shown are likely lower than what is experienced during the school year. At all of the intersections counted, the peak hour in the morning began at 7:30 am and the peak hour at lunch time began at 12:00 or 12:15 pm. In the late afternoon, the peak hour for the intersections nearest UNM (at Cornell, Stanford, and Columbia) began at 3:00 pm or 3:15 pm, while at the other intersections it began between 4:15 and 4:45 pm.

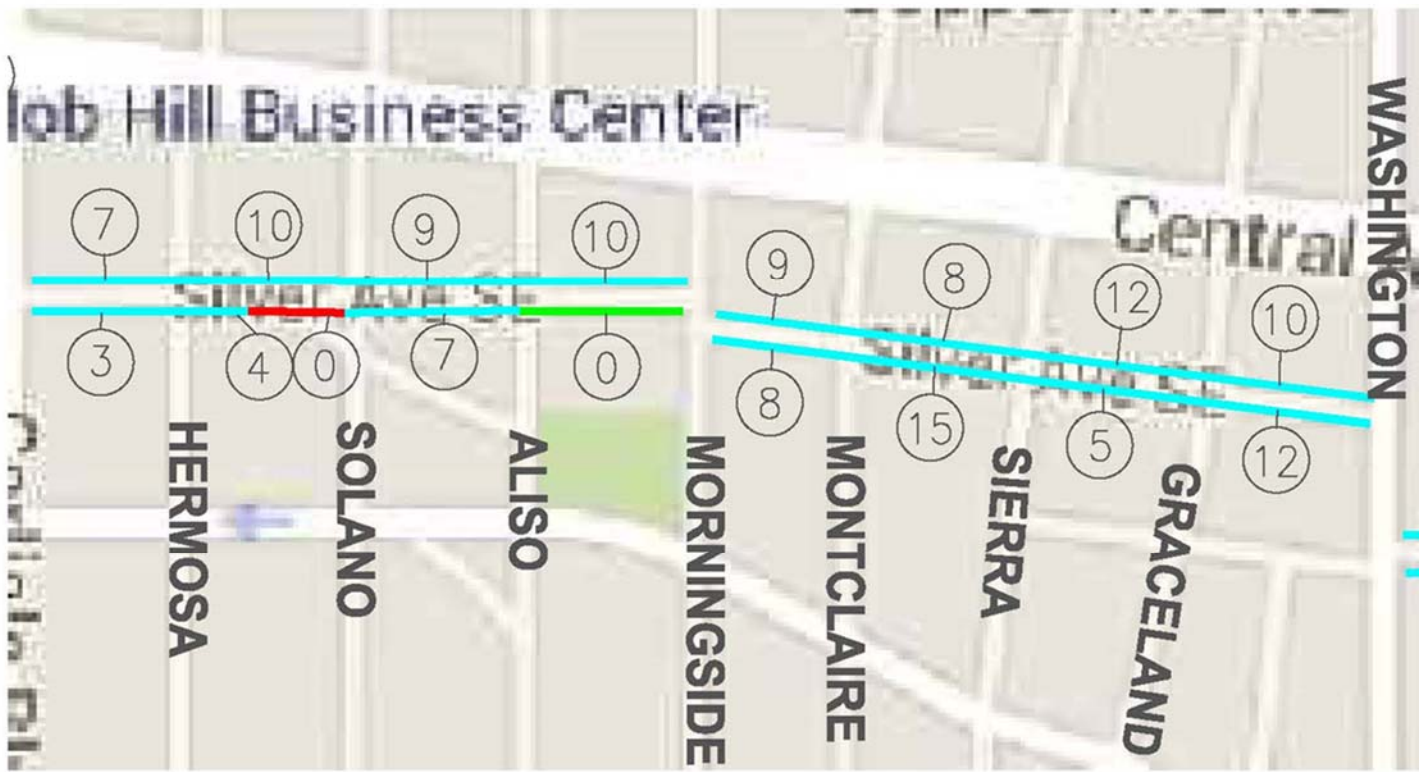
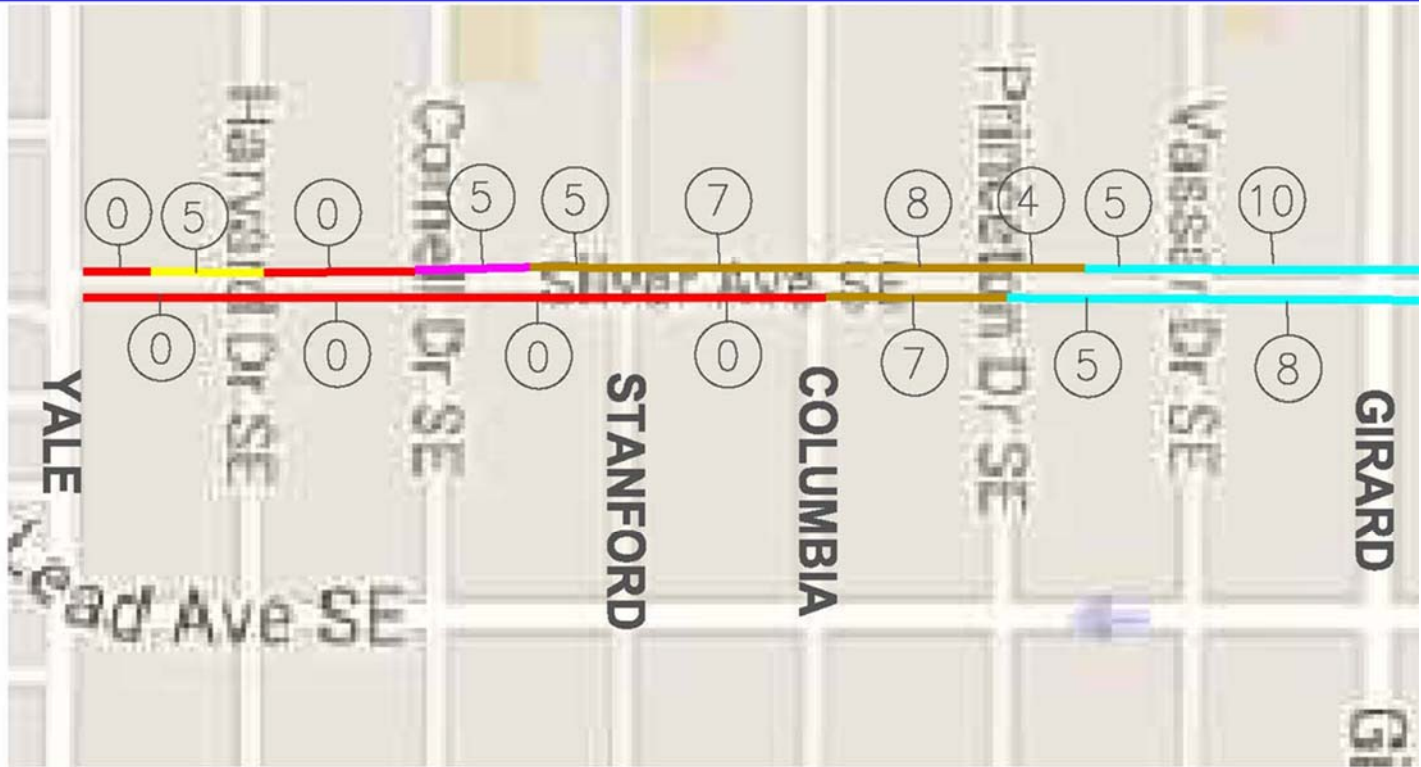
- Yale Boulevard
- Harvard Drive
- Cornell Drive
- Stanford Drive
- Columbia Drive
- Girard Boulevard
- Carlisle Boulevard (north intersection)
- Carlisle Boulevard (south intersection)

Along with motor vehicles, bicyclists, pedestrians and skateboard movements were counted at the same intersections along Silver Avenue. Figure 3, which summarizes these road users, shows the total volume of pedestrians, bicyclists, and skateboarders crossing each intersection leg in a total of eight hours observed in one day.

Crashes

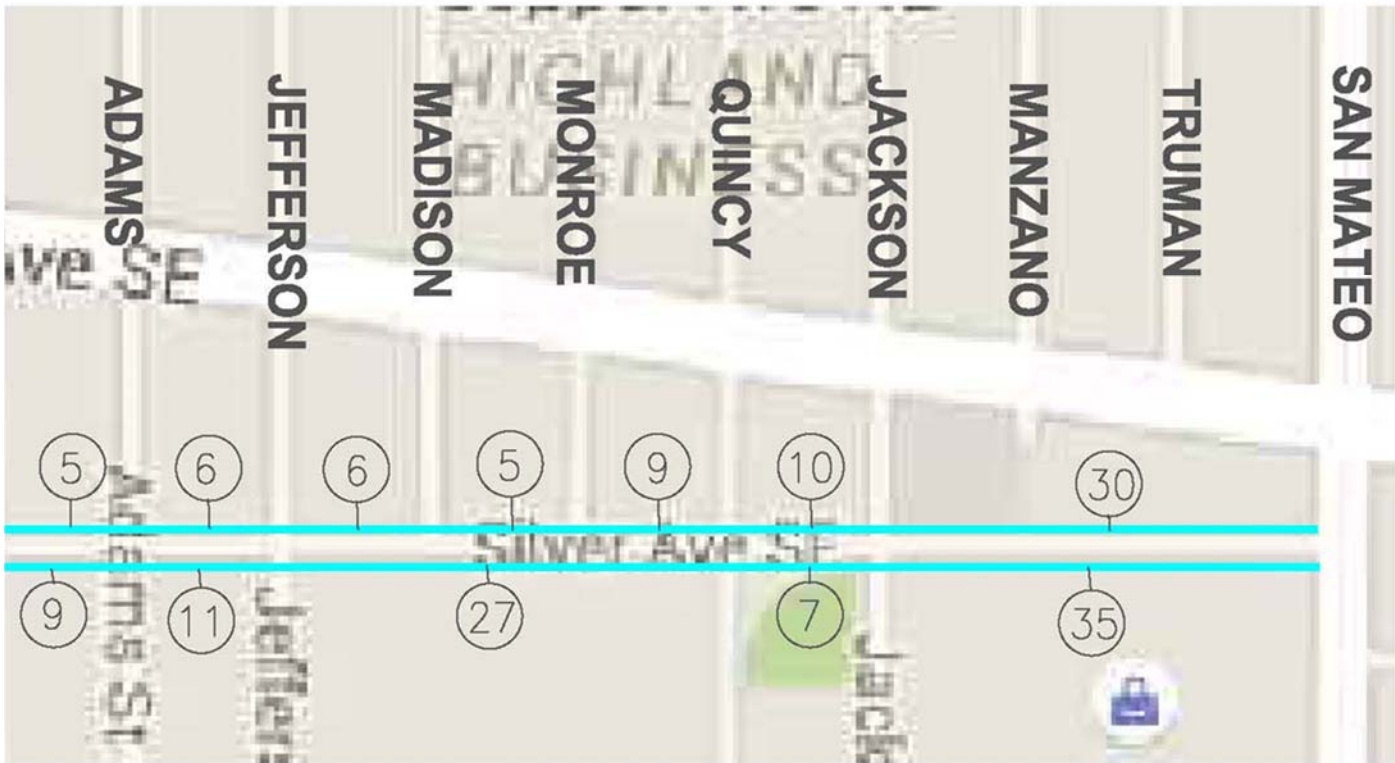
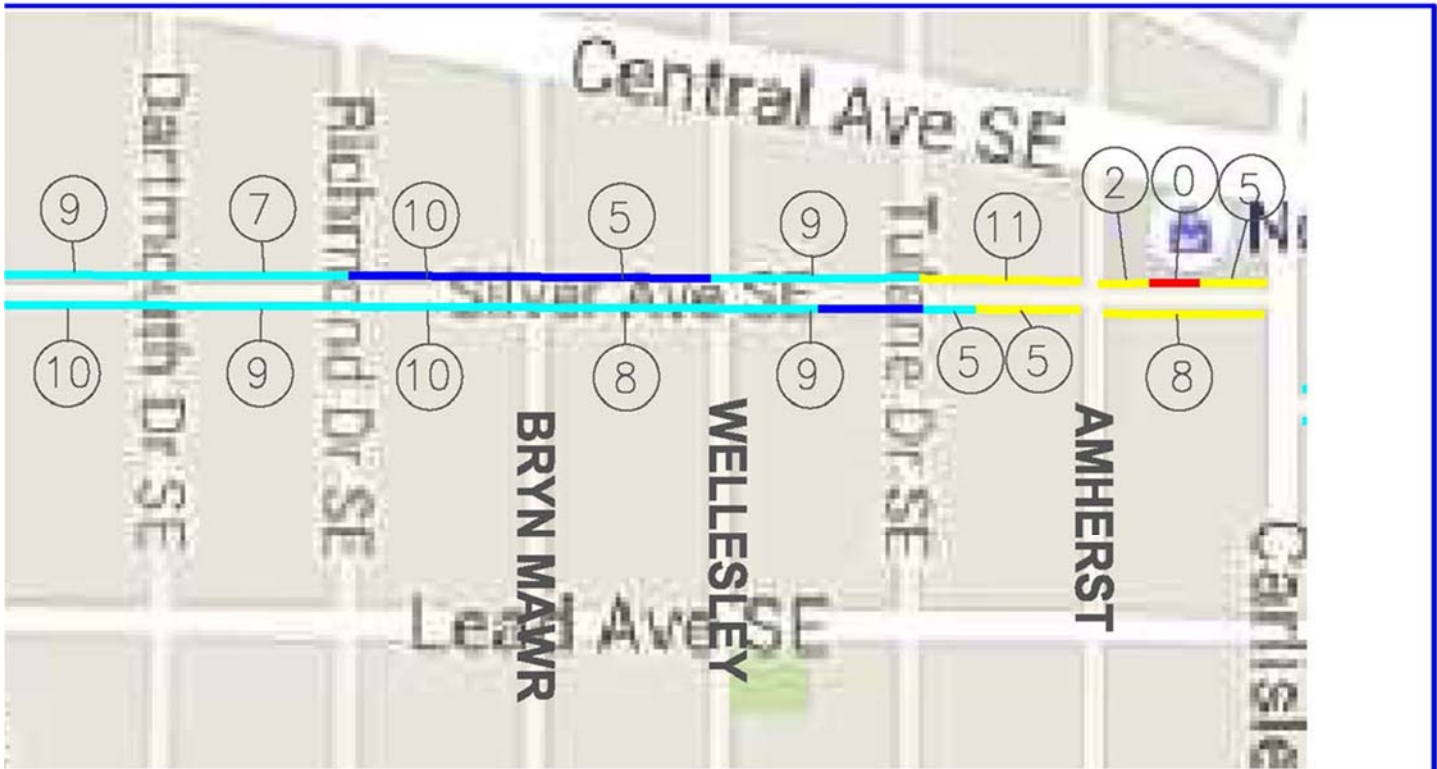
Summarized crash data for the period of 2010 through 2013 was obtained from UNM's Traffic Research Unit; they are included in Appendix E. During that time 99 crashes were reported on Silver Avenue between Yale Boulevard and San Mateo Boulevard.

A large number of crashes, 27 of the 99 (27%), involved a parked vehicle. This could be a result of the narrow street width combined with the on-street parking. Ten crashes involved a bicyclist. Four crashes involved a pedestrian, and one of these, which occurred on July 3, 2012, was the only fatal crash during that time period. Looking only at crashes involving pedestrians and bicyclists, 13 of the 14 crashes occurred in the one-mile section of Silver Avenue between Yale Boulevard and Carlisle Boulevard, while just one of the 14 crashes occurred in the one-mile section of Silver Avenue between Carlisle Boulevard and San Mateo Boulevard.



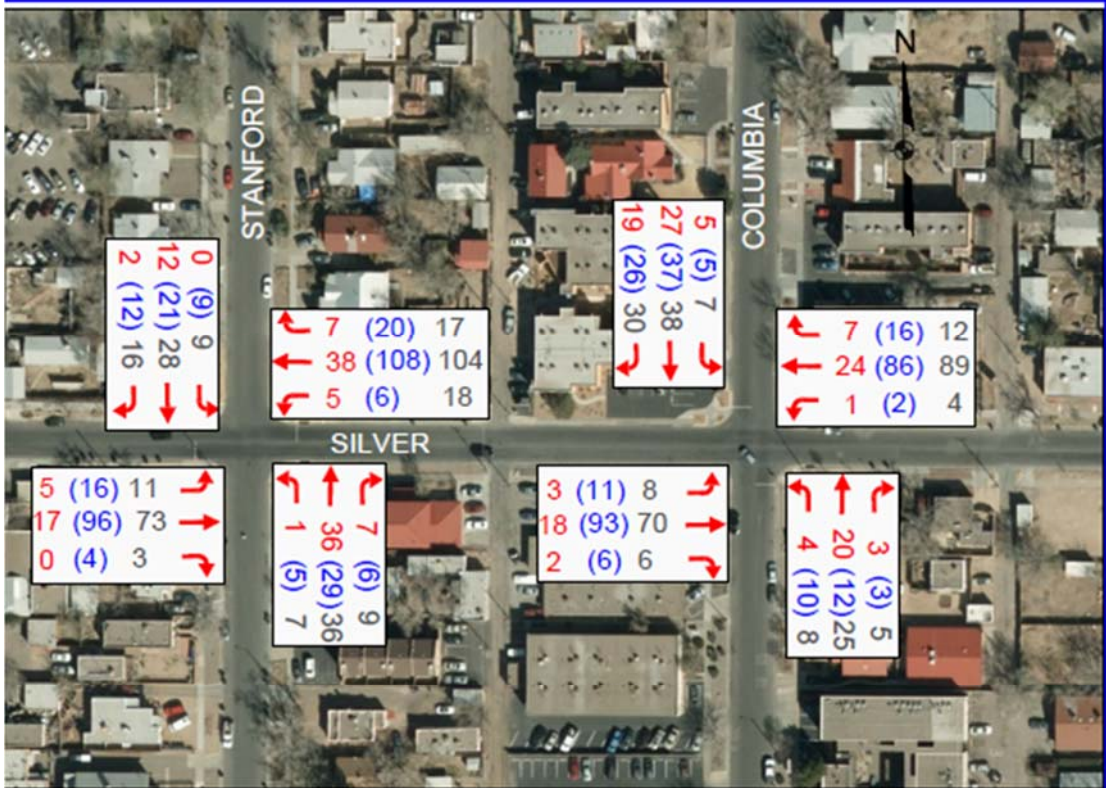
LEGEND

- | | | | | | |
|--|---|------------|------------------------------|---|--------|
| Free on-street parking (no time limit) | — | Light Blue | Meter parking (2 hour limit) | — | Yellow |
| Housing complex driveway | — | Green | Meter parking (1 hour limit) | — | Pink |
| Free on-street parking (2 hour limit) | — | Blue | No parking | — | Red |



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Figure 1. Parking Study Results



LEGEND

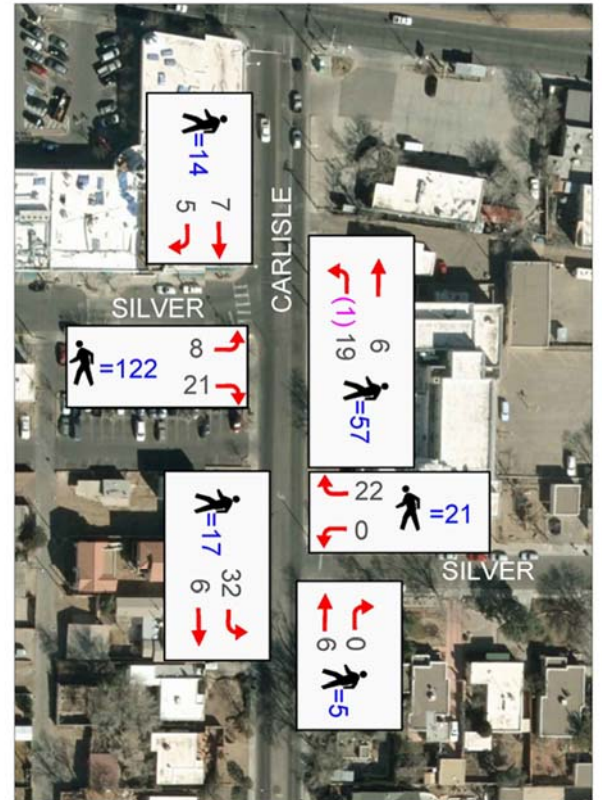
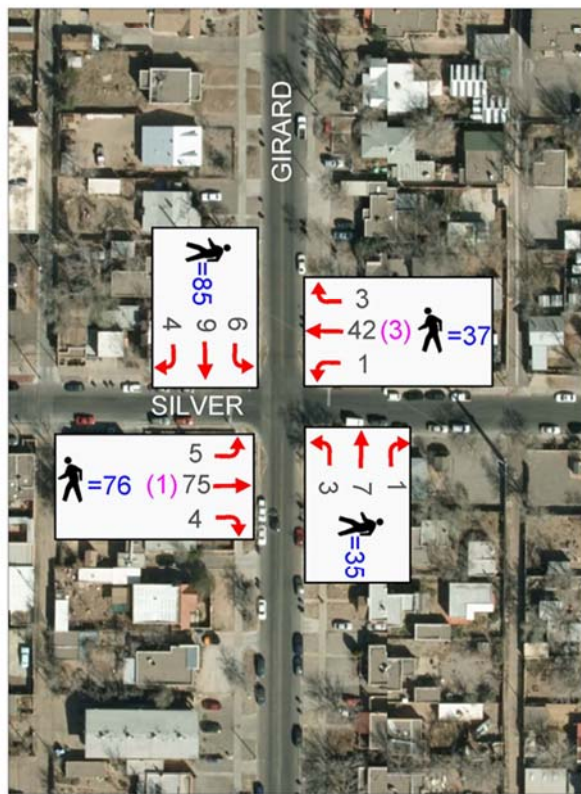
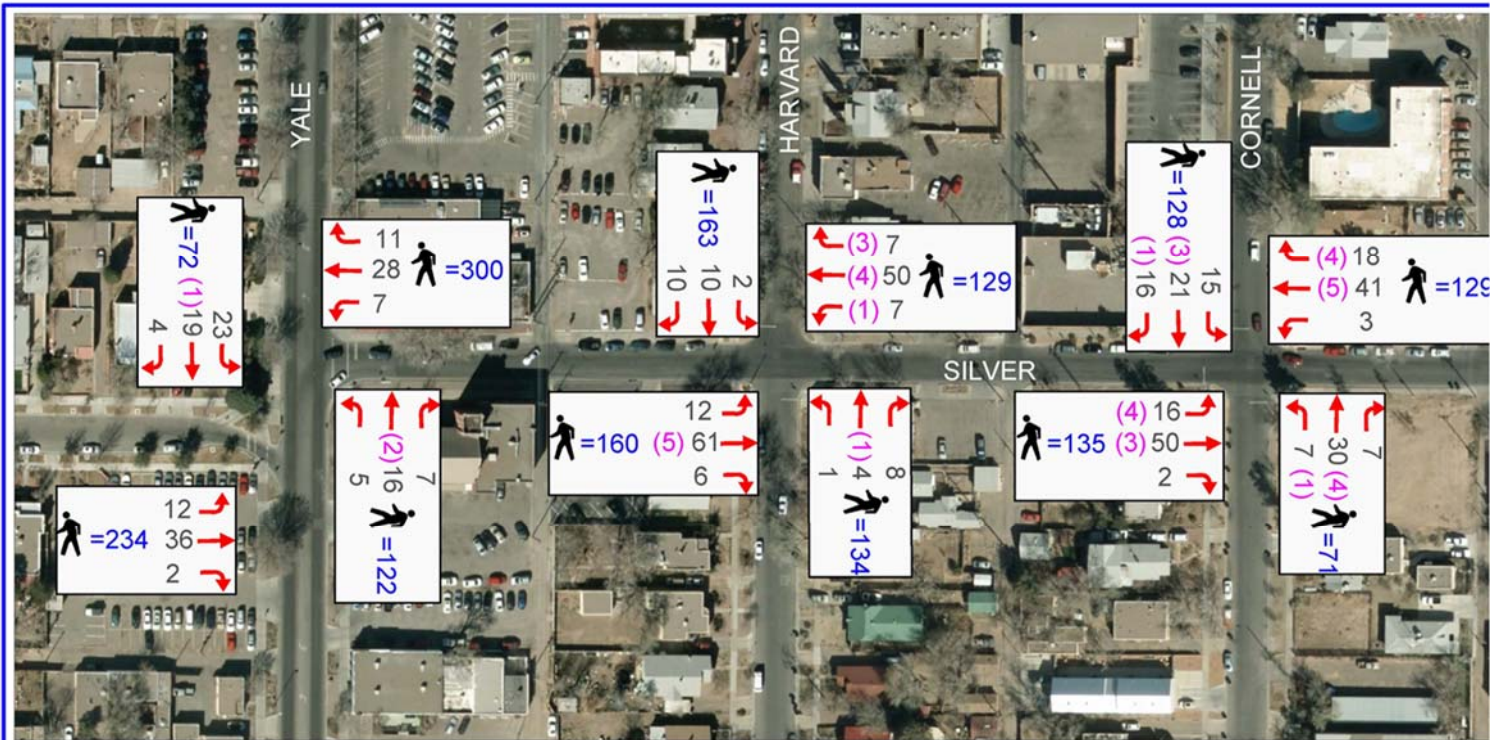
AM PEAK HOUR

(LUNCH PEAK HOUR)

PM PEAK HOUR

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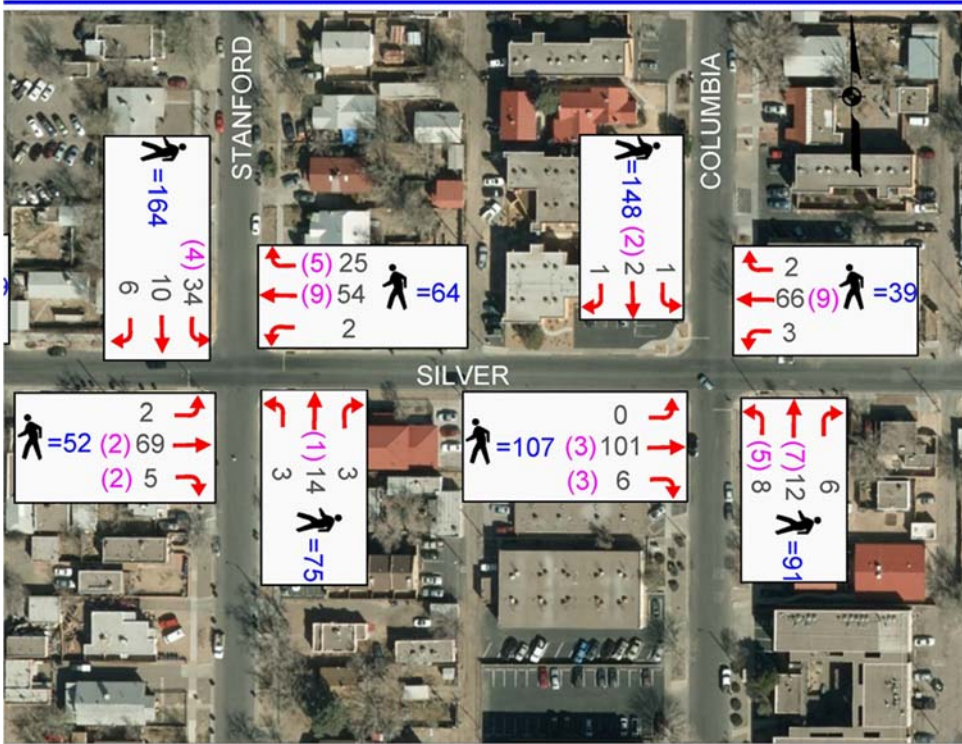
Figure 2. Hourly Traffic Turning Movements (May 2015)






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Drawing File: U:\BLU\PROJECTS\CIENT\94354-CITY OF ALBUQUERQUE\94-4354-009 SILVER AVENUE\02\688\01\SILVER TRAFFIC COUNT\8\TRAFFIC COUNTS.DWG

DESIGNED BY: J



LEGEND

-  = NUMBER OF PEDESTRIANS CROSSING LEG OF INTERSECTION IN EIGHT HOURS COUNTED
-  = TOTAL NUMBER OF BIKES IN 8 HOURS COUNTED
-  (TOTAL NUMBER OF SKATEBOARDERS IN 8 HOURS COUNTED)

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Figure 3. Non-Motorized User Counts (over 8 hours, May 2015)

None of the pedestrian or bicyclist crashes was a hit-and-run. Just one of the crashes was reported to have involved alcohol or drugs (the crash between Stanford and Columbia). The data in Table 3 is excerpted from a larger crash summary; without the crash reports themselves it is difficult to tell what led to any of these crashes and what might have been done to prevent them. The column with the header “Highest Contributing Factor” provides some explanation about why some of the incidents occurred.

Table 3. Pedestrian and Bicyclist Crashes on Silver Avenue, Yale Boulevard to San Mateo Boulevard (2010-2013)

Location	Crash Type	Time of Crash	Severity	Highest Contributing Factor
At Yale Blvd.	Pedestrian	7:05 pm (June)	Property Damage Only	Driver inattention
At Stanford Dr.	Pedestrian	2:58 pm (March)	Injury	None reported
At Stanford Dr.	Cyclist	3:00 pm (April)	Property Damage Only	Failure to yield/Cyclist struck the vehicle
Between Stanford and Columbia	Cyclist	4:15 pm (February)	Property Damage Only	Alcohol or drugs involved
Near Columbia Dr.	Cyclist	4:11 pm (December)	Injury	Excessive speed
At Columbia Dr.	Cyclist	8:45 am (October)	Injury	Failure to yield/Vehicle struck cyclist
At Princeton Dr.	Pedestrian	11:23 am (July)	Ped fatality	Pedestrian collision/vehicle going straight
Near Princeton Dr.	Cyclist	8:20 am (July)	Injury	None reported
Near Richmond Dr.	Cyclist	6:47 pm (July)	Injury	None reported
Near Bryn Mawr Dr.	Cyclist	8:06 pm (September)	Property Damage Only	None reported
Between Bryn Mawr and Wellesley	Cyclist	7:25 pm (April)	Injury	Driver inattention
At Carlisle Blvd.	Cyclist	10:39 pm (September)	Injury	Vehicle struck cyclist head on/driver inattention
At Monroe St.	Pedestrian	2:37 pm (December)	Injury	No driver error

Existing Study and Plan Documents

A number of study and plan documents were researched for this project. A list of the documents reviewed for the Silver study, and a summary of what each says about Silver and its use as a bike boulevard, are listed below.

University Neighborhoods Sector Development Plan (July 1986)

This sector plan, which is nearly 30 years old, recommends the addition of parking meters along the north side of Silver Avenue between Harvard and Cornell drives, and recommends pedestrian improvements along Silver Avenue. An excerpt from this plan that addresses bikeways along Silver Avenue is shown here:

BIKEWAYS

Background: During the neighborhood and task force meetings conducted for this plan update there was general support expressed for the development of bikeways through the area and for a bikeway connection along Silver Boulevard to the downtown. Besides Silver Avenue, Princeton and Buena Vista from Silver south are designated bike routes. These can contribute to the solution of the automobile traffic and parking problems.

Areas of the city such as the University Neighborhoods, however, where population is concentrated and bike travel is heaviest, are the areas in which it is most difficult to create bikeways because of the established street pattern and parking and traffic congestion. Interstate 25 and the railroad tracks, in particular, form barriers to the development of a Silver Boulevard bikeway. In addition, Silver currently provides needed parking for the Central Avenue commercial area and for residents west of Yale Boulevard.

Bikeway Recommendation:

Area merchants and residents, should work with the Bikeway Committee to further develop the bike routes in the area.

from University Neighborhoods Sector Plan, July 1986

City of Albuquerque Bike Boulevard Resolution FSR-07-268 (September 2007)

This resolution designates Silver Avenue from Yale Boulevard to San Mateo Boulevard (as well as further west) as a bike boulevard. It establishes the speed limit on the bike boulevard as 18 mph. It also notes that converting a local street into a bike boulevard may include removing barriers and detours to through-cycling, removing stop signs from the boulevard and stopping traffic approaching from intersecting streets, installing bike-permeable street closures and mandatory turns, installing bike-actuated signals or mid-block crossings at intersections with major streets, and appropriately signing the route.

DRAFT Girard Boulevard Complete Street Master Plan (March 2013)

This plan, which is currently a draft, shows the excerpts below in regards to the Silver Avenue intersection. Members of the Silver Avenue study team met with the City project manager for the Girard Boulevard project on September 15, 2015. At this meeting the group agreed that because the current recommended improvements for Girard Boulevard at Silver involve only changes to pavement markings, the current recommended improvements at that intersection would be implemented when the Girard project goes forward. The striping improvements will not preclude any improvements at the intersection recommended in the Silver Avenue study from being implemented separately.

Silver Avenue

The intersection drawing for Girard Boulevard and Silver Avenue shows the potential for detached curb extensions on all four corners of the intersection. Both Girard Boulevard and Silver Avenue have on-street parking. Adding curb extensions at the intersections will narrow the intersection, likely decreasing vehicle speeds and decreasing crossing distances for pedestrians. These efforts aim to enforce Silver Avenue's designation as a Bicycle Boulevard by further enhancing conditions for cyclists, while simultaneously providing traffic calming measures along Girard Boulevard. Consideration was given to switching the stop sign from Silver Avenue to Girard Boulevard to give bicyclists on Silver Avenue priority and to reduce the number of stops they are required to make. However, this raises several concerns, including higher traffic volumes along Girard Boulevard and Silver Avenue's proximity to Central Avenue. If determined necessary, additional safety enhancements could be provided such as a bike accessible push-button assembly on both approaches of Silver Avenue that would allow cyclists to activate a rectangular rapid flash beacon to facilitate a creation of gaps in traffic along Girard Boulevard and minimize their delay.

Bicycle Boulevard

The Silver Avenue Bicycle Boulevard intersects Girard Boulevard one block south of Central Avenue. Typically, bicycle boulevards are designed to give cyclists priority right-of-way, however, the City's Department of Municipal Development has said that there is not enough distance between the busy intersection with Central Avenue and the next intersection with Silver Avenue to add stop signs or signals at this location. Small chicanes were installed on Girard Boulevard to slow traffic at this intersection, but it remains a difficult intersection for cyclists and pedestrians to cross.



City of Albuquerque Project No. 5015.06 Bicycle Boulevard Assessment (June 2014)

This study, administered by the City's DMD, provides an inventory of the existing Silver Avenue bike boulevard, bicyclist crash data, and traffic volumes. The sections from that assessment that apply to this project are shown in Appendix F.

Nob Hill Highland Sector Development Plan (as amended through August 2014)

This sector plan was adopted in 2007 but amendments made to the plan after that date were incorporated into the document in August 2014. Excerpts from this sector plan that apply to Silver Avenue are the following.

- The sector plan states that the addition of on-street parking on Central between Washington and San Mateo will reduce traffic lanes from six to four. It then states, "this lane reduction could result in increased use of both Silver and Copper, as there are few east-west options for through traffic along this section of the Plan area. Therefore, Silver and Copper avenues between Washington and San Mateo should be enhanced to carry overflow traffic while maintaining sensitivity to neighboring residential areas."
- The sector plan recommends that the diagonal diverters at the Silver/Sierra and Silver/Montclair intersections be removed. It states, "The existing diverters on Silver Avenue were implemented at a time when the community wanted to keep undesirable traffic from neighborhoods and thus reduce crime. The diverters and police enforcement successfully accomplished their goals. Therefore, this plan calls for removing the diverters at Sierra and Montclair Streets. Removal of these barriers supports the recommended pedestrian refuges (on Central) by allowing vehicles prohibited from turning onto Central Avenue to use alternate routes." Later in the sector plan it reads, "Silver Avenue, as a parallel street to Central Avenue, should provide for local circulation and allow drivers to access signalized intersections on Central Avenue. Therefore, the plan calls for removal of the diverters at Sierra and Montclair Streets."
- The sector plan calls for the section of Silver Avenue between Washington and San Mateo to be designated as a bike route, and recommends Central Avenue's designation between these two streets to be removed as a bike route (because of safety concerns).
- The sector plan recommends establishing "Night Sky Friendly" pedestrian-scale lighting on Silver Avenue in the sector plan limits (Girard to San Mateo).

Albuquerque Rapid Transit Project Central Avenue Corridor (March 2015)

Central Avenue runs parallel to Silver Avenue and is just one block north of Silver. The display boards for this project show that the proposed ART along Central will take one driving lane in each direction away along Central, will eliminate north-south through and all left-turn access at many streets, and will add bus rapid transit stops along Central in the area of the Silver project. At the signalized intersections along Central, U-turns will be signalized to facilitate the movements eliminated by the prohibited left turns. The display boards are shown in Appendix G.

IDENTIFICATION OF DEFICIENCIES

The existing conditions along Silver Avenue that were summarized above were compared to various references offering guidance and regulation on each topic. The references used were:

- Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD, 2009)
- National Association of City Transportation Officials (NACTO) Urban Streets Design Guide (2013)
- NACTO Urban Bikeway Design Guide (2014)
- DRAFT City of Albuquerque Bikeways and Trails Facilities Plan (March 2015 revision)
- City of Albuquerque Development Process Manual (DPM, October 2008 revision)
- City of Albuquerque Code of Ordinances, Chapter 8: Traffic Code
- City of Albuquerque Code of Resolutions, Article 7: Sector Development and Community Development Plans
 - University Neighborhoods Sector Development Plan (July 1986)
 - Nob Hill Highland Sector Development Plan (December 2006) and amendments
- City of Albuquerque Bike Boulevard Resolution FSR-07-268 (September 2007)
- DRAFT City of Albuquerque Girard Boulevard Complete Streets Master Plan (March 2013)
- City of Albuquerque Project No. 5015.06 Bicycle Boulevard Assessment (June 2014)
- City of Albuquerque 50 Mile Loop Plan (September 2013)
- Bicycling Street Smarts/Riding Confidently, Legally and Safely (John S. Allen, 2001)
- American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities (2012)
- Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG, 2011)
- New Mexico Statutes Annotated (NMSA) Chapter 66 – Motor Vehicles

Sight Distance at Alleys

Alleys in the area are operating as streets but without traffic control (i.e., stop signs). In some places (for example, at the alley on the north side of Silver between Harvard and Cornell) there is a sight distance problem for pedestrians on the sidewalk: the wall of the PNM building on the north side blocks the view of pedestrians on the sidewalk from what's approaching southbound on the alley. The alleys on the north side of Silver west of Dartmouth and east of Richmond may have a similar sight distance issue.

Guidance/Regulation

NMSA 66-7-346 (Stop before emerging from alley or private driveway) The driver of a vehicle within a business or residence district emerging from an alley, driveway or building shall stop such vehicle immediately prior to driving onto a sidewalk or the sidewalk area extending across any alleyway or driveway, and shall yield the right-of-way to any pedestrian as may be necessary to avoid collision, and upon entering the roadway shall yield the right-of-way to all vehicles approaching on said roadway.

Evaluation

By law, vehicles exiting alleys must stop prior to crossing the sidewalk, but they don't always, especially when they cannot see that there is a pedestrian on the sidewalk because the sight triangle is blocked by a building.

Parking

Throughout the corridor it is unclear where on-street parking is allowed and where it is prohibited.

Guidance/Regulation

The **MUTCD** does not prescribe universal curb color standards. Per the MUTCD, white and yellow curbs are sometimes used for delineation. Curb markings without word markings or signs may be used to convey a general prohibition by statute of parking with a specified distance of a stop sign, yield sign, driveway, fire hydrant, or crosswalk. The MUTCD only requires signs to be used to convey parking regulations in conjunction with curb markings in areas where curb markings are frequently obscured by snow and ice accumulation.

MUTCD Where parking is prohibited at all times or at specific times, the basic design for parking signs shall have a red legend and border on a white background (Parking Prohibition signs). Where only limited-time parking or parking in a particular manner are permitted, the signs shall have a green legend and border on a white background (Permissive Parking signs). As an alternate to the use of arrows to show designated restriction zones, word messages such as BEGIN, END, HERE TO CORNER, HERE TO ALLEY, THIS SIDE OF SIGN, or BETWEEN SIGNS may be used. Where parking is prohibited during certain hours and time-limited parking or parking in a particular manner is permitted during certain other time periods, the red Parking Prohibition and green Permissive Parking signs may be used together.

Albuquerque City Ordinance 8-1-2-28 (PARKING OR STANDING ON NARROW STREETS) The Mayor, or his designated representative, is authorized to erect signs indicating no parking or no standing upon one side of a street when the width of the roadway does not exceed 32 feet.

Albuquerque City Ordinance 8-1-2-31 (STOPPING, STANDING OR PARKING NEAR HAZARDOUS OR CONGESTED PLACES) The Mayor, or his designated representative, is authorized, upon the basis of engineering and traffic study and investigation, to determine and designate zones by proper signs, placed at adequate intervals to inform the motorist, in which the stopping, standing or parking of vehicles will create an especially hazardous condition or will cause unusual delay to traffic and no person shall stop, stand or park a vehicle in any such designated place.

Albuquerque City Ordinance 8-1-2-34 (CURB LOADING ZONE) Upon the basis of a traffic engineering study, the Mayor, or his designated representative, is authorized to determine the location of passenger, freight and special curb loading zones and shall place and maintain appropriate signs indicating the same and stating the hours during which the provisions of this subsection are applicable.

Albuquerque City Ordinance 8-5-1-1 (STOPPING, STANDING OR PARKING PROHIBITED NO SIGNS REQUIRED) No person shall stop, stand or park a vehicle except when necessary to avoid conflict with other traffic or in compliance with law or the directions of a police officer or traffic control device, in any of the following places:

- (A) Next to a curb which is painted either yellow or red.
- (C) Within three feet of a public or private driveway.
- (E) Within 15 feet of a fire hydrant.
- (F) On a crosswalk or within ten feet of a crosswalk at an intersection.
- (G) Within 30 feet of the approach to any flashing beacon, stop sign, yield sign, or traffic control signal located at the side of a roadway, unless the Mayor or his designated representative has specifically, by markings or by parking meters, indicated parking to be permitted.

Albuquerque City Ordinance 8-5-1-4 (STOPPING, STANDING OR PARKING WITHIN CERTAIN HOURS PROHIBITED BY SIGNS). At the request of the residents of a residential area, the Mayor shall study the parking problems of the area and, if the following requirements are met, may create a residential permit parking area. Requirements for establishment of such an area are:

- (A) A determination that more than 75% of the available on-street parking spaces in the residential area are being used or have been used for a significant portion of time by persons who are not residents of the area; and
- (B) The petition of at least 51% of the living units of the residential area for permit parking.

Albuquerque City Ordinance 8-5-1-16 (PARKING PROHIBITED IN FIRE LANE) No persons shall either stop, stand or park a vehicle in a marked fire lane or otherwise obstruct such lane, whether such lane is public property or on private property which is devoted to public use. Such fire lane shall be marked either with a sign or a red curb.

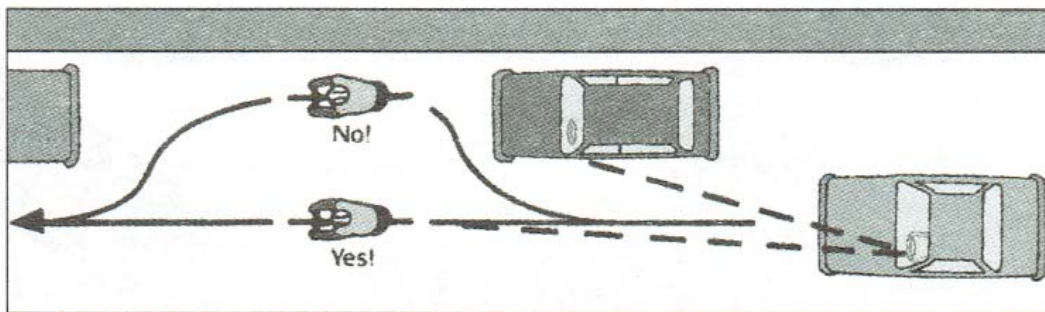
The **University Neighborhoods Sector Development Plan**, which is nearly 30 years old, recommends the addition of parking meters along the north side of Silver Avenue between Harvard and Cornell drives.

Evaluation

City Ordinance does not require that prohibited parking areas be designated with both painted curb and signs. Per City Ordinance, yellow-painted curb, red-painted curb (for fire lanes), or no-parking signs may all be used alone or in combination. Green-painted curb was observed to be used for a loading zone in the Nob Hill area, but City Ordinance does not specify green as the color for loading zones, nor does it specify that parking is prohibited adjacent to green-painted curb. During the walking survey, members of the study team agreed that the inconsistency in curb painting and no parking signs along Silver made it difficult to tell where parking was and was not allowed.

Bicyclist Path

Because there is on-street parking in some areas and not in others, there is no consistency in a bicyclists' path within the cross section of Silver.



Guidance/Regulation

NACTO Urban Bikeway Design Guide On-street parking spaces may be delineated with paint or other materials to clearly indicate where a vehicle should be parked and to discourage motorists from parking their vehicles too far into the adjacent travel lane. In a case study looking at the influence of pavement markings and bicyclist positioning, researchers found that, “the bicycle lane [with an edge line demarcating the parking lane] was the most effective at keeping cars parked closer to the curb and encouraging cyclists to ride in a consistent position at intersections.”

Draft City of Albuquerque Bikeways and Trails Facilities Plan Delineating on-street parking spaces with paint or other materials clearly indicates where a vehicle should be parked and can discourage motorists from parking their vehicles too far into the adjacent travel lane. This helps cyclists by maintaining a wide enough space to safely comfortably share a travel lane with moving vehicles while minimizing the need to swerve farther into the travel lane to maneuver around parked cars. In addition to benefiting cyclists, delineated parking spaces also promote the efficient use of on-street parking by maximizing the number of spaces in high-demand areas.

City of Albuquerque Bicycle Boulevard Assessment A white parking lane stripe (6 inches to 12 inches in width) can be placed eight feet (8') from the edge of the curb in order to visually alert drivers and cyclists that a car is moving in and out of the lane. Eight feet (8') is the recommended distance because it allows space for the vehicle and room for the driver to open his or her door.

Bicycling Street Smarts/Riding Confidently, Legally and Safely “Don’t weave between parked cars, where you become invisible to overtaking drivers and must repeatedly reenter the traffic flow. It’s much safer to ride in a predictable, straight line, where everyone can see you. Motorists don’t mind slowing down for a predictable, visible bicyclists nearly as much as they mind a bicyclists who swerves out in front of them.”

Evaluation

Measures such as pavement striping and consistency in the location of on-street parking should be considered to keep bicyclists in a straight path along Silver.

Regulatory/Warning Signs and Pavement Markings

Stop signs along Silver Avenue, summarized in Table 4, are inconsistent: some intersections have stop control on Silver, some have stop control on the side street, and some are all-way stop-controlled. What may be confusing is that because of the inconsistent use of “ALL WAY” and “CROSS TRAFFIC DOES NOT STOP” supplemental plaques, sometimes drivers do not know whether the cross street traffic has to stop or not.

Guidance/Regulation

NACTO Urban Bikeway Design Guide Stop signs along a bicycle boulevard increase travel time for bicyclists and may be viewed as unnecessary, resulting in low compliance and unpredictability. On many local streets, stop signs are ‘woven’ such that travelers along local streets must stop at every other intersection. On bicycle boulevards this pattern should be altered to remove stop signs on the bikeway and reorient them towards intersecting local streets. This provides clarity at the intersections, while creating a more continuous flow of bicycle travel.

NACTO Urban Bikeway Design Guide Minor street crossings for bicycle boulevards typically involve the intersection of two residential or local streets with low motor vehicle volumes and speeds. At intersections with local streets and minor collectors, bicycle boulevards should have right-of-way priority and reduce or minimize delay by limiting the number of stop signs along the route. Stretches of at least a half mile or more of continuous travel without stop sign control are desirable.

City of Albuquerque DPM A bike boulevard should limit bicycle stops to one per quarter-mile or preferably one per half-mile spacing.

AASHTO Guide for the Development of Bicycle Facilities Bicycle boulevards function as a through street for bicyclists while discouraging through automobile travel, and design elements may include stop signs at intersections that assign priority to the bicycle boulevard

Table 4. Signs and Supplemental Plaques at Stop-Controlled Cross Streets along Silver Avenue

Cross Street	Type of Stop Control	Eastbound	Westbound	Northbound	Southbound
Yale Boulevard	Silver stops	n/a	No supplemental plaque		
Cornell Drive	All-way stop	4-WAY (heavily tagged)	4-WAY	4-WAY	4-WAY
Stanford Drive	Silver stops	Cross Traffic Does Not Stop (heavily tagged)	Cross Traffic Does Not Stop		
Princeton Drive	All-way stop	ALL WAY	No supplemental plaque	ALL WAY	No supplemental plaque
Girard Boulevard	Silver stops	Cross Traffic Does Not Stop	Cross Traffic Does Not Stop		
Richmond Drive	All-way stop	ALL WAY	ALL WAY	ALL WAY	ALL WAY
Amherst Drive	All-way stop	4-WAY	4-WAY	4-WAY	4-WAY
Carlisle Boulevard	Silver stops	No supplemental plaque	No supplemental plaque		
Hermosa Drive	Silver stops	No supplemental plaque	No supplemental plaque		
Solano Drive	Silver stops	No supplemental plaque	No supplemental plaque		
Aliso Drive	Silver stops	No supplemental plaque	No supplemental plaque		
Morningside Drive	Silver stops	No supplemental plaque	No supplemental plaque		
Washington Street	Silver stops	No supplemental plaque	No supplemental plaque		
Monroe Street	All-way stop	ALL WAY	No supplemental plaque		No supplemental plaque
San Mateo Boulevard	Silver stops	No supplemental plaque	n/a		

AASHTO Guide for the Development of Bicycle Facilities Attempts to enforce “full stop” compliance at stop-controlled junctions where most riders find they can safely yield without making a full stop are unlikely to be successful, given bicyclists’ strong counterincentive to minimize the amount of energy needed to regain momentum after stopping or slowing. Signing bike routes on local streets with many stop signs gives a conflicting message to riders: the streets may appear inviting, but a requirement to stop at every block is discouraging. Developing bicycle boulevards where through bicycle movement with few stops is facilitated by design is a better solution.

City of Albuquerque Bike Boulevard Resolution Converting a local street into a bike boulevard may include removing stop signs from the boulevard and stopping traffic approaching from intersecting streets.

City of Albuquerque Bicycle Boulevard Assessment In order to limit cyclist delay along a bicycle boulevard, guidance recommends that Stop Signs (R1-1) not be installed in the direction of bicycle use. If deemed appropriate, the use of Yield Signs (R1-2) is recommended. The reasoning is that when a cyclist must stop, it requires time to regain momentum. If a cyclist is forced to stop too many times, it may lead the cyclist to seek an alternate route. Using Yield signs better allows a cyclist to maintain their momentum resulting in less frustration while using the corridor

MUTCD At intersections where all approaches are controlled by STOP signs, an ALL WAY supplemental plaque (R1-3P) shall be mounted below each STOP sign. The ALL WAY plaque shall have a white legend and border on a red background. Supplemental plaques with legends such as 2-WAY, 3-WAY, 4-WAY, or other numbers of ways shall not be used with STOP signs.

MUTCD The CROSS TRAFFIC DOES NOT STOP (W4-4P) plaque may be used in combination with a STOP sign when engineering judgment indicates that conditions are present that are causing or could cause drivers to misinterpret the intersection as an all-way stop.

Evaluation

To meet the half-mile stop sign spacing recommended by NACTO and preferred by the City of Albuquerque DPM, traffic on Silver Avenue would have to stop only at the intersections of Yale, Girard, Carlisle, Washington, and San Mateo. Under current conditions traffic on Silver has to stop at Yale, Cornell (all-way), Stanford, Princeton (all-way), Girard, Richmond (all-way), Amherst (all-way), Carlisle, Hermosa, Solano, Aliso, Morningside, Washington, Monroe (all-way), and San Mateo.

All stop signs at all-way stop controlled intersections should be supplemented with an ALL WAY plaque. The Stanford and Girard stop signs have the supplemental message “Cross Traffic Does Not Stop.” Where this message does not supplement the stop sign, motorists and cyclists may assume that cross traffic does stop.

Sight Distance for Bicyclists where Cross Traffic Doesn’t Stop

Where traffic on the bike boulevard must stop and traffic on the intersecting street does not have to (Yale, Stanford, Girard, Carlisle, Hermosa, Solano, Aliso, Morningside, Washington) sight triangles must be clear to allow bicyclists to cross the street. Sometimes the sight triangles are blocked by parked cars.

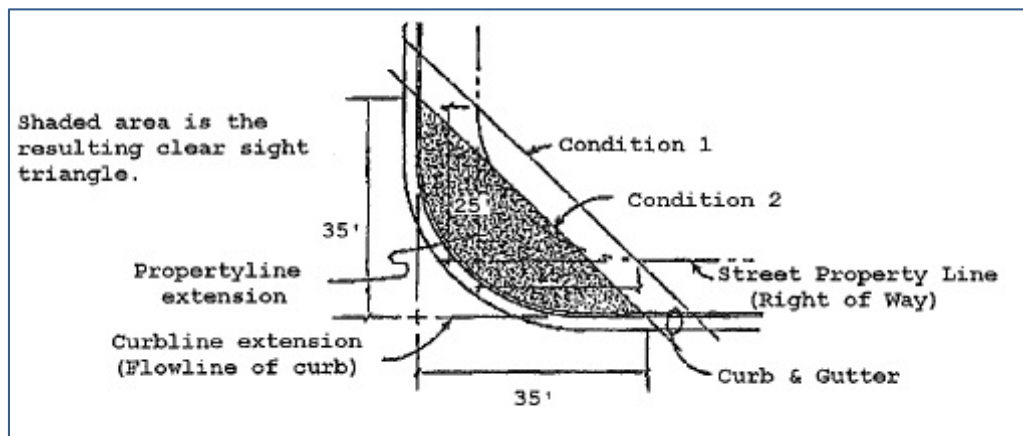
Guidance/Regulation

NACTO Urban Bikeway Design Guide On bicycle boulevards at stop controlled unsignalized crossings with curb extensions, forward stop bars for bicyclists may be provided. A bicycle forward stop bar can reduce the minimum acceptable gap by one second per side of the street.

Draft City of Albuquerque Bikeways and Trails Facilities Plan A second stop bar for cyclists placed closer to the centerline of the cross street than the first stop bar increases the visibility of cyclists waiting to cross a street. This treatment is typically used with other crossing treatments (i.e., curb extension) to encourage cyclists to take full advantage of crossing design. They are appropriate at unsignalized crossings where fewer than 25 percent of motorists make a right turn movement.

City of Albuquerque DPM Intersection designs must provide for clear sight distances in the horizontal plane. Minimum intersection visibility should comply with the following specific language from Section 2-15 of the Traffic Code:

No such obstruction to view between three and eight feet above the gutter line shall be placed or maintained within a triangular area at the street corner, which area is bounded by: (1) the street property lines of the corner lot and a line connecting points twenty-five feet distant from the intersection of the property lines of such lot, or (2) the curb lines of an intersection and a line connecting points thirty-five feet distant from the corner of the intersection and such corner is determined by projecting the curb lines out to a specific point, whichever is the lesser."



Evaluation

There are eight intersections where bike boulevard traffic has to stop but cross street traffic does not (Yale, Stanford, Girard, Carlisle, Hermosa, Solano, Aliso, Morningside, Washington). At Stanford, Girard, Carlisle, and Morningside, parking is prohibited within the DPM sight triangle on the cross street with a yellow painted curb and in most places no-parking signs, or there is a driveway present. This sight triangle is based on the sight distance needed for a motor vehicle driver. Bicyclists are slower in accelerating and crossing, but have the advantage of being able to creep closer to the side street traffic than a driver in a motor vehicle. A forward stop bar should be considered to encourage bicyclists to pull up to the location where they need to be in order to see cross street traffic. At the Hermosa, Solano, Aliso, and Washington intersections, the appropriate curb painting and signing does not appear to be in place to prohibit parking within the sight triangle.

Posted Speed Limit

The City of Albuquerque Bike Boulevard Resolution establishes the speed limit on bike boulevards as 18 mph. Some of the speed limit signs are missing.

The 85th percentile speeds on Silver Avenue are 24 mph west of Tulane Drive, 26 mph west of Graceland Drive, and 28 mph east of Quincy Street.

Guidance/Regulation

NACTO Urban Bikeway Design Guide Bicycle boulevards should have a maximum posted speed of 25 mph. Some jurisdictions are starting to sign residential speed limits below 25 mph. Simply changing the speed limit is unlikely to reduce speeds; speed management and street design techniques are necessary. Once actual speeds decrease, lower speed limit signs can reinforce the desired speed with regulatory control. Targeted enforcement is also recommended.

MUTCD The Speed Limit (R2-1) sign shall display the limit established by law, ordinance, regulation, or as adopted by the authorized agency based on the engineering study. The speed limits displayed shall be in multiples of 5 mph. When a speed limit within a speed zone is posted, it should be within 5 mph of the 85th-percentile speed of free-flowing traffic.

Evaluation

The 18 mph speed limit signs are inconsistent with the MUTCD rule that speed limits displayed shall be in multiples of 5 mph. The novelty of the 18 mph speed limit sign may be a reason some of the signs are missing.

Under the current conditions, the posted speed limit of 18 mph is below the observed 85th percentile speeds that ranged between 24 and 28 mph.

Center Pavement Striping

East of Washington, Silver Avenue has a center double yellow pavement stripe.

Guidance/Regulation

MUTCD Center line markings shall be placed on all paved urban arterials and collectors that have a traveled way of 20 feet or more in width and an ADT of 6,000 vehicles per day or greater. Center line markings should be placed on paved urban arterials and collectors that have a traveled way of 20 feet or more in width and an ADT of 4,000 vehicles per day or greater. Center line markings may be placed on other paved two-way traveled ways that are 16 feet or more in width.

NACTO Urban Bikeway Design Guide Center line stripes (if present) shall be removed or not repainted, except for short sections on intersection approaches that have a stop line or traffic circle. Drivers have an easier time passing bicyclists on roads that do not have centerline stripes.

Evaluation

Center line stripes are not required by the MUTCD on local roads. NACTO does not recommend center line stripes on bicycle boulevards so that it is easier for drivers to pass bicyclists; however, Silver Avenue east of Washington is so wide that passing room is generally not an issue.

Wayfinding Signs and Striping

Wayfinding signs for the bike boulevard are missing in some locations. Many wayfinding pavement markings are worn out. Where the bike boulevard changes course, it is sometimes difficult to tell where to go based on the wayfinding signs and pavement markings, especially at Yale Boulevard, Carlisle Boulevard, Morningside Drive, and the Graceland-Mesa Grande detour. The traffic diverter at Silver and Morningside appears to be designed so that westbound bicyclists ride to the right of the island, but riding to the left is easier and more direct.

Per The City's Draft Bikeways and Trails Facilities Plan, the Silver bike boulevard will end at Jackson Street (not San Mateo), and there will be a bike boulevard connection on Monroe Street to the north. The Silver Avenue bike boulevard is part of Segment 4 (Near Heights/Nob Hill/University) of the City's 50 Mile Loop Plan.

Guidance/Regulation

City of Albuquerque Bicycle Boulevard Assessment Wayfinding signs provide cyclists with direction, distance, and/or travel times. Common colors used for identification signs are white on purple. Lettering size should be no less than 2 inches in height. Wayfinding signs should be located ahead of or at the beginning of the bicycle boulevard, ahead of major intersections, and in advance of turns at a distance great enough to allow for preparation of turn.

City of Albuquerque Draft Trails and Bikeways Master Plan Design Manual For Bicycle Boulevards, the D11-1 "Bike Route" sign (white on green) shall be used for shared roadways. Shared lane markings may be applied.

City of Albuquerque Bicycle Boulevard Assessment Pavement markings should be located after each intersection, in intervals of approximately 200 feet, and near high volume driveways or other conflict points. Size of pavement markings shall comply with MUTCD standards, and should be made of thermoplastic material.

NACTO Urban Bikeways Design Guide On narrow local streets where it can be difficult for cars traveling in opposite directions to pass, pavement markings should be applied in closer intervals near the center of the travel lane.

NACTO Urban Bikeways Design Guide Where the bicycle boulevard turns or jogs onto another street, signs and/or markings shall be provided to indicate how users can remain on the route.

NACTO Urban Bikeways Design Guide Bicycle wayfinding signage and pavement markings shall be included on bicycle boulevards. Pavement markings and identification/wayfinding signs provide a strong visual identity for the street and designate the corridor as a bicycle route.

NACTO Urban Bikeways Design Guide Decision and turn signs should include destinations with arrows and distance and/or bicycling times (assuming a typical speed of 10 mph).

NACTO Urban Bikeways Design Guide Signs may differ from those outlined in the MUTCD to highlight or brand the bicycle boulevard network.

NACTO Urban Bikeways Design Guide For wayfinding purposes, the orientation of the chevron marking at offset intersections may be adjusted to direct bicyclists along discontinuous routes. Alternately, an arrow may be used with the chevrons to indicate the direction of the turn.

The **Federal Highway Administration (FHWA)** response to the FAQ, "What Section in the MUTCD is applicable to Bicycle Boulevards?" is the following:

"A bicycle boulevard is not a traffic control device and therefore is not discussed in the Manual. However, the standardized devices used to sign, mark and operate a bicycle boulevard are. As a result, modifying any of these devices just to draw special attention, educate the community or brand a bicycle boulevard between one municipality and an adjacent municipality is a misuse of a traffic control device. In fact, non-uniformity can contribute to intolerance, community acceptance issues and enforcement problems."

AASHTO Guide for the Development of Bicycle Facilities Design elements on bike boulevards may include wayfinding signs to key destinations and shared lane pavement markings.

Evaluation

The white on purple wayfinding signs are not in conformity with the MUTCD, which reserves the color purple for toll signs. However, this color is commonly being used for bike boulevards all over the country. The MUTCD and draft City of Albuquerque Trails and Bikeways Facilities Plan both recommend white on green signs for bicycle boulevards.

The pavement markings identifying Silver Avenue as a bike boulevard are wearing off the pavement. Also, they are not spaced as closely as recommended by the Bicycle Boulevard Assessment (every 200 feet). This spacing would result in three pavement markings per block in each direction.

Where the bicycle boulevard changes course, additional signs or pavement markings should be considered to direct bike boulevard users to the correct path. Also, because the segment of Silver between Yale and Morningside is part of the City's 50 Mile Loop, the appropriate directional, destination, and milepost signs (every half mile) should be placed in accordance with the plans for the Loop. It may be possible to mount the Silver Bike Boulevard and 50-Mile Loop signs on the same post.



50 Mile Loop Signs

Traffic Volume

Many residents feel that Silver's daily traffic volume is too high for a bike boulevard. West of Tulane the daily traffic volume counted in early May 2015 was about 2,000 vehicles per day (vpd). West of Graceland the count was approximately 500 vpd, and east of Quincy Street the count was about 2,300 vpd. Classified as a local street, Silver should not be expected to handle overflow traffic from Central, especially after lanes on Central are removed to construct the Bus Rapid Transit project.

Guidance/Regulation

AASHTO Guide for the Development of Bicycle Facilities Traffic volumes on a bike boulevard should be under 3,000 vpd.

NACTO Urban Bikeway Design Guide Bicycle boulevards should be designed for motor vehicle volumes under 1,500 vpd, with up to 3,000 vpd allowed in limited sections of the bicycle boulevard corridor.

NACTO Urban Bikeway Design Guide If vehicles cannot easily pass each other using the full width of the street, it is likely that there is too much traffic for the street to be a successful bicycle boulevard.

AASHTO Guide for the Development of Bicycle Facilities Design elements on bicycle boulevards may include traffic diverters to reduce through motor vehicle traffic while permitting passage for through bicyclists

City of Albuquerque Bike Boulevard Resolution Converting a local street into a bike boulevard may include installing bike-permeable street closures and mandatory turns.

Nob Hill Highland Sector Development Plan Lane reductions on Central between Washington and San Mateo (to create on-street parking on Central) will reduce traffic lanes from six to four. The lane reduction could result in increased use of both Silver and Copper, as there are few east-west options for through traffic along this section of the Plan area. Therefore, Silver and Copper avenues between

Washington and San Mateo should be enhanced to carry overflow traffic while maintaining sensitivity to neighboring residential areas.”

Nob Hill Highland Sector Development Plan The diagonal diverters on Silver Avenue were implemented at a time when the community wanted to keep undesirable traffic from neighborhoods and thus reduce crime. The diverters and police enforcement successfully accomplished their goals. Silver Avenue, as a parallel street to Central Avenue, should provide for local circulation and allow drivers to access signalized intersections on Central Avenue. Therefore, the plan calls for removal of the diverters at Sierra and Montclair streets.

Evaluation

The current daily traffic volumes on Silver are under the 3,000 vpd recommendation by AASHTO, but the sections on either end of the corridor are not under the 1,500 vpd recommendation by NACTO.

The Nob Hill Highland Sector Development Plan recommends “enhancements” to Silver Avenue between Washington and San Mateo to carry overflow traffic from Central. This is in opposition to other City policies for the bicycle boulevard.

Traffic diverters and mandatory turns are recommended ways to decrease traffic volumes on a bicycle boulevard.

Use by Skateboarders

Many skateboarders use Silver. They ride all over the street, and sometimes on the sidewalks.

Guidance/Regulation

City of Albuquerque Ordinance 8-3-1-1 (TOYS, COASTERS, ROLLER SKATES AND THE LIKE RESTRICTED) No person shall use any skateboard either upon any sidewalk in any business district or upon any street, bicycle lane or bicycle path.

Evaluation

The way the ordinance is written makes it difficult to tell where skateboarders are allowed to ride.

Intersection Crossings

Several of the cross street intersections where Silver traffic has stop control and the cross street does not are problematic for through bicyclists on the bike boulevard because of fast speeds on the cross street.

Guidance/Regulation

NACTO Urban Bikeway Design Guide Intersections with bicycle facilities should reduce conflict between bicyclists (and other vulnerable road users) and vehicles by heightening the level of visibility, denoting a clear right-of-way, and facilitating eye contact and awareness with competing modes. At unsignalized crossings of major streets, treatments should aim to decrease crossing distance, increase the number of available crossing gaps, improve visibility for bicyclists and people using the cross street, and/or enhance the general awareness of the crossing.

NACTO Urban Bikeway Design Guide Advance crossing warning signs such as MUTCD W11-1 (bicycle symbol on yellow warning sign) should be placed on intersecting streets with more than 5,000 vpd. A non-standard sign using the coloration and style of other bicycle boulevard signs may be used with an arrow showing bi-directional cross traffic.

AASHTO Guide for the Development of Bicycle Facilities Design elements on bicycle boulevards may include crossing improvements at busy streets. Crossing improvements may include a traffic signal, median refuges that are at least 8 feet long and 6 feet wide, or curb extensions on crossing main streets with on-street parking.

City of Albuquerque Bike Boulevard Resolution Bike boulevard intersections may involve installing bike-actuated signals or mid-block crossings at intersections with major streets.

Evaluation

The cross streets of Yale Boulevard, Girard Boulevard, Carlisle Boulevard, and Washington Street all have daily traffic volumes of over 5,000 vpd and should have bike boulevard warning signs and standard signs for the bike boulevard showing its crossing location. (Morningside Drive may not have that volume threshold.) All of these streets do have the W-11 warning sign in both directions; additionally, there are message pavement markings (BIKE XING) on some of the approaches. The bicycle boulevard signing is less conspicuous, and generally limited to white-on-purple Bicycle Blvd street name signs on the stop sign pole.

The Girard intersection has temporary curb bulb outs to allow bicyclists to pull out slightly farther into the intersection before crossing, thereby narrowing the crossing distance. The curb bulb outs are also intended to slow down traffic on Girard at that location. The City of Albuquerque's draft Girard Complete Streets Master Plan recommends curb extensions at all four corners of this intersection to make it easier for bicyclists to cross and to slow down traffic on Girard. The plan also proposes a pedestrian- or bicyclist-activated rapid rectangular flashing beacon at the crossing as a measure to minimize delay for pedestrians and bicyclists along Silver.

At the other high-volume intersections, there are no special treatments for the bicycle boulevard crossing.

Offset Intersections

The Silver Avenue study corridor has four intersections that are offset: at Yale Boulevard, at Carlisle Boulevard, at Morningside Drive, and at Washington Street.

Guidance/Regulation

NACTO Urban Bikeway Design Guide The selection of the appropriate treatment at offset intersections depends on the width and traffic characteristics of the intersecting street and on whether the bicycle boulevard jogs to the right or to the left. When a bicycle boulevard crosses a major street at an offset intersection, additional corridor and crossing treatments may be required to preserve the attractiveness and comfort of the bicycle boulevard. If an intersecting street has traffic speeds and volumes equivalent to the bicycle boulevard, no treatment is needed, although wayfinding (signing and pavement markings) should clearly direct bicyclists through the offset.

Evaluation

At all four of the offset intersections in the study corridor, the traffic speeds and volumes are higher than those on Silver Avenue; there are currently no crossing treatments, although there is some limited wayfinding signing and pavement markings.

Street Lighting

Street lighting is inconsistent. Alleys should be lighted for security reasons.

Guidance/Regulation

City of Albuquerque DPM On local streets, 100 watt High Pressure Sodium Vapor lights shall be located at all intersections, at right angle turns, and at mid-block locations where block lengths exceed 500'.

The **Nob Hill Highland Sector Development Plan** recommends establishing “Night Sky Friendly” pedestrian-scale lighting on Silver Avenue in the sector plan limits (Girard to San Mateo).

Evaluation

All side street intersections have street lighting, but most alley intersections do not. There is pedestrian-scale lighting along Silver between Tulane and Carlisle on both sides of the street.

Accessibility

The Silver/Dartmouth intersection does not have wheelchair ramps at any of the four corners.

Guidance/Regulation

The **Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG)** require that if altered, pedestrian facilities must be made accessible and usable by pedestrians with disabilities.

Evaluation

Wheelchair ramps, and possibly other modifications, would have to be constructed at the Silver/Dartmouth intersection if the intersection corner is being altered by construction. It should be noted that most of the other existing wheelchair ramps in the study area would not meet current design guidelines for accessibility, and would also have to be brought up to current standards if altered by construction.

RECOMMENDED IMPROVEMENTS

Based on the above, recommendations for improvements were made and are described in the sections below, starting from the west side of the corridor at Yale Boulevard. These recommendations have been refined based on public input (described later in this report) and input from City departments.

All Blocks

Along all of the blocks of the Silver bike boulevard, new 18 mph speed limit and Bicycle Boulevard guide sign assemblies (Figure 4) should be in place at the beginning of each block. It is recommended that a white sharrow be marked on the pavement at the beginning and past the halfway point (usually the alley) of each block.

The City’s DMD supports the use of green paint to increase the visibility of a bicycle facility, and has received interim approval from FHWA to use it on a pilot project elsewhere in the city (on MLK Avenue) in 2016. However, until its performance on that project has been evaluated, green paint has not been approved for widespread use in the city. For the Silver project, DMD has requested that green paint be used only where it will not be traversed by motor vehicles (i.e., only in the bike refuge areas in the medians).

Curb bulbouts should be built at all intersection corners to delineate and protect the adjacent parking areas, to narrow the street width and promote slower driving speeds, and to narrow the crossing distance for northbound and southbound pedestrians.

Where parking is not allowed, the curb should be painted yellow (or red if it is a fire zone). If parking is not allowed for the entire block on a certain side of the street, the “No Parking This Side of Street” sign should be used (Figure 6) along the block.



Figure 4 Speed Limit and Guide Sign Assembly



Figure 5 Sharrow on Green¹ Rectangle Pavement Marking



Figure 6 Example No Parking Sign

¹The City's DMD supports the use of green paint to increase the visibility of a bicycle facility, and has received interim approval from FHWA to use it on a pilot project elsewhere in the city (on MLK Avenue) in 2016. However, until its performance on that project has been evaluated, green paint has not been approved for widespread use in the city. For the Silver project, DMD has requested that green paint be used only where it will not be traversed by motor vehicles (i.e., only in the bike refuge areas in the medians).

Yale Boulevard Crossing

The concept for the Yale Boulevard crossing is shown in Figure 7. Median crossing protection for the bike boulevard should be installed in Yale Boulevard as shown. Per the request of DMD, the raised medians should be placed on both sides of each bicyclist refuge area, and all of the raised medians should be built with pinned curb, so that it can be tested how these medians affect southbound left-turning traffic. The new raised median in Yale should be designed to allow full motor vehicle access into and out of Silver. Guide sign assemblies and pavement markings should be placed to guide riders through the offset intersection. Major cross street signing and striping should be placed to warn northbound and southbound Yale traffic approaching the Silver bike boulevard.

In final design, the precise locations of the raised medians will need to be carefully considered to best accommodate the needs of both bicyclists taking refuge in the center of Yale and motor vehicles turning onto or off of Silver Avenue.

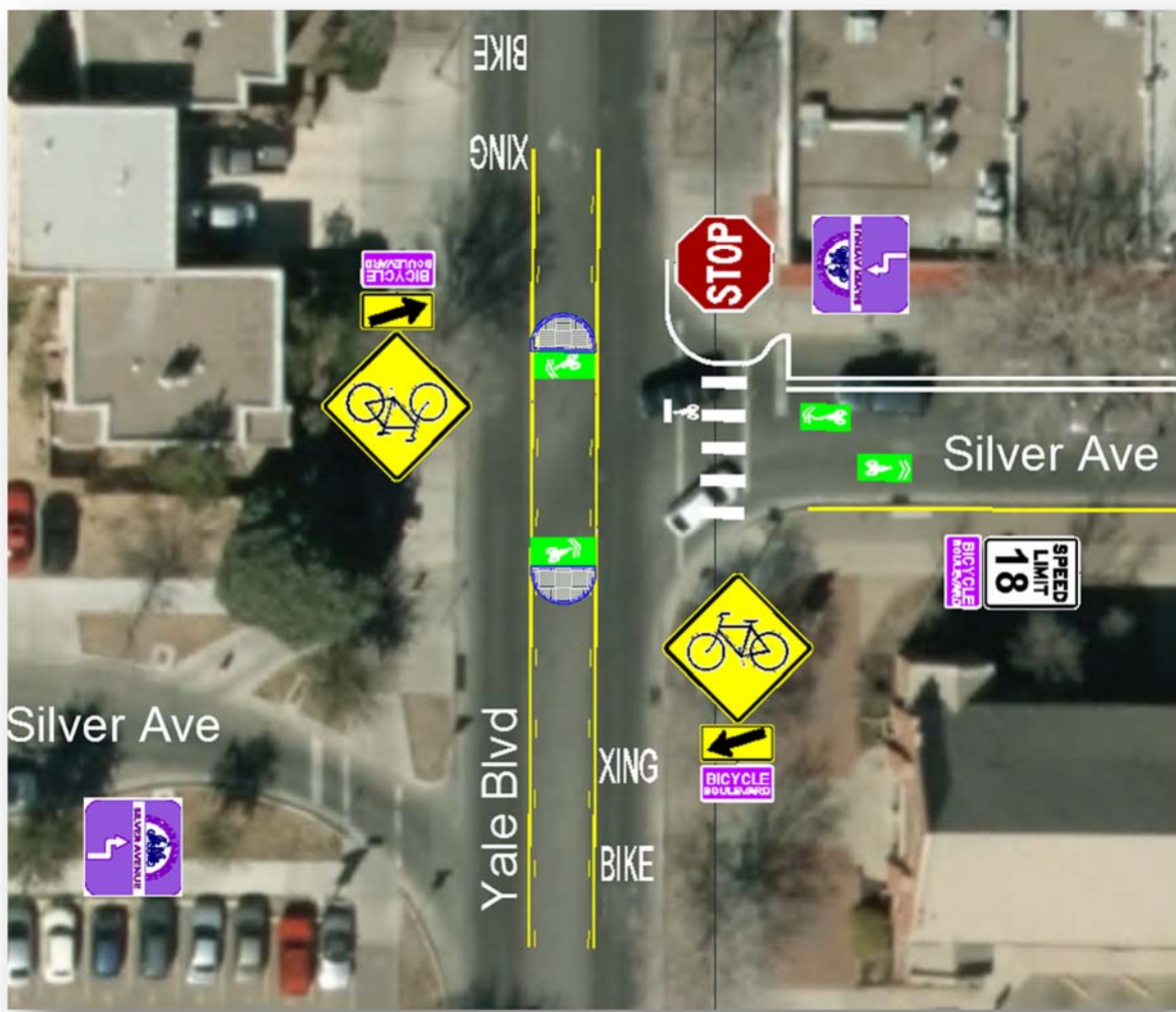


Figure 7. Silver Bike Boulevard Crossing at Yale



Figure 8. Examples of an Advance Stop Bar for Bicyclists

Yale to Girard

Four-inch white pavement striping should be used to demarcate the allowable parallel parking areas along the north side of Silver. Figures 11 and 12 show the typical section and plan view. As an option, the “door zone” for parallel-parked cars may be marked with a second 4” white pavement stripe parallel to the first and offset by two feet, as shown in Figure 9. To further delineate this space as a “no ride” zone, diagonal white lines could be striped between the two parallel lines; however, maintenance of the striping and visual clutter should be considered.

Curb bulbouts should be built at the alley intersection on the north side of Silver between Harvard and Cornell and at any other location where sight distance at the alley is limited. This will allow the sidewalk in that area to be moved away from the building, as shown in Figure 10, to provide better sight distance between alley drivers and pedestrians.

At the Silver/Cornell intersection, the stop bars and stop signs should be removed from all approaches at Cornell and replaced with a traffic circle and all-way yield control, as shown in Figure 13. Crosswalks may be striped along all four legs of the intersection.

At the Silver/Stanford intersection, the stop bars and stop signs should be removed from the Silver approaches at Stanford and placed on the side street approaches so that only Stanford traffic stops.

At the Silver/Princeton intersection, the stop bars and stop signs should be removed from all approaches at Princeton and replaced with a traffic circle and all-way yield control (similar to the Cornell intersection as shown in Figure 13). Crosswalks may be striped along all four legs of the intersection.

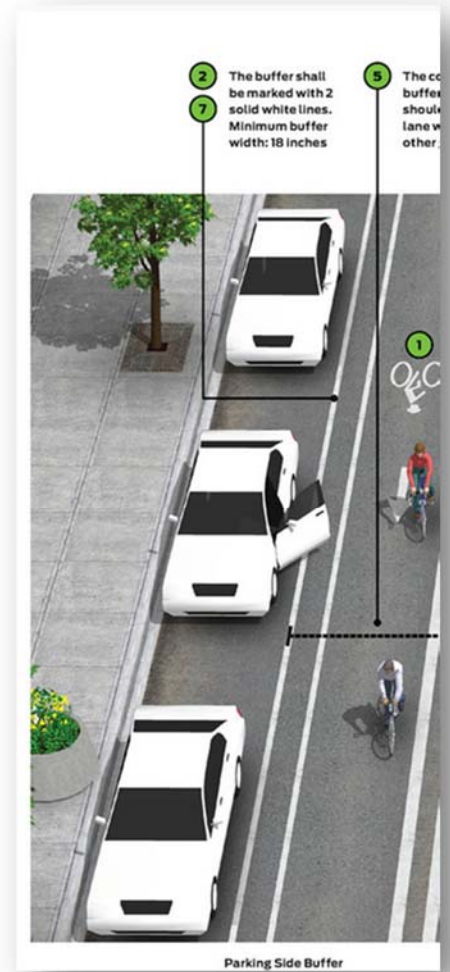


Figure 9 Example of Pavement Markings for Door Zone



Figure 10 Sidewalk Bulbout at Alley to Improve Sight Distance

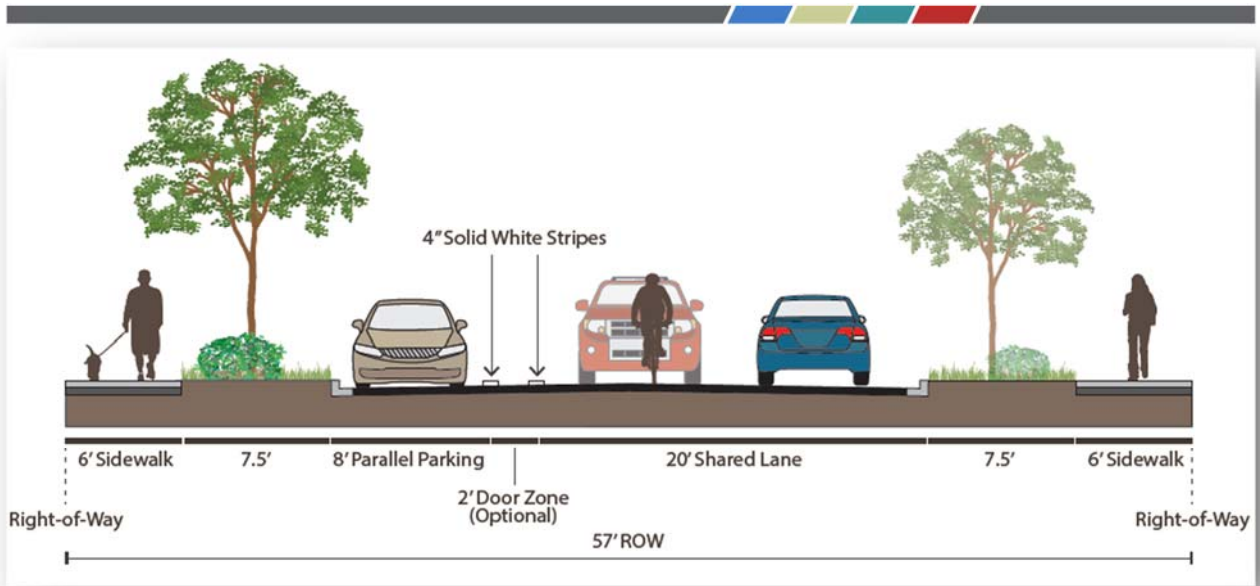


Figure 11 Proposed Typical Section from Yale to Girard

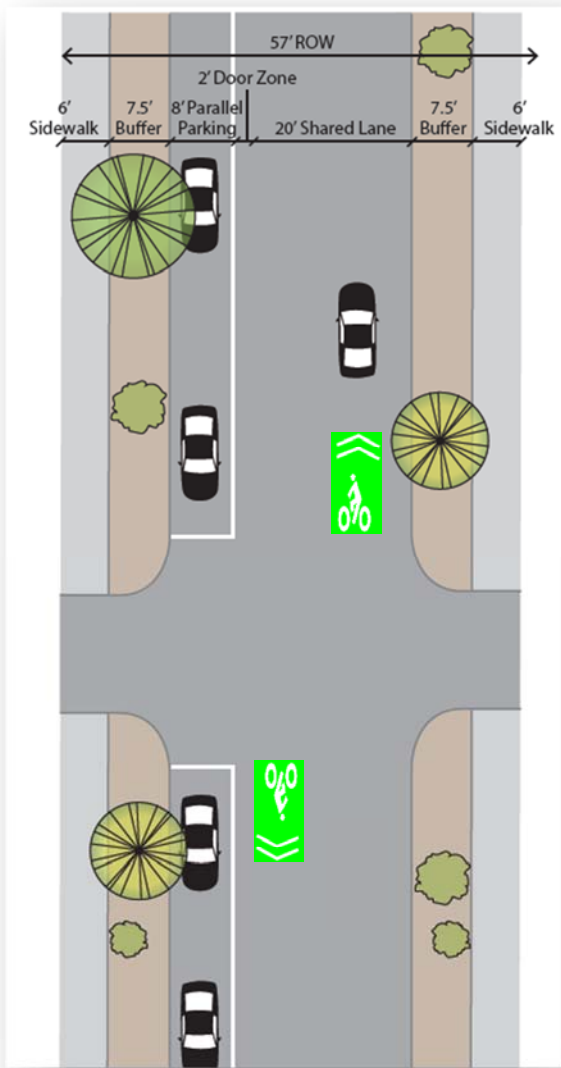


Figure 12 Proposed Cross Section from Yale to Girard

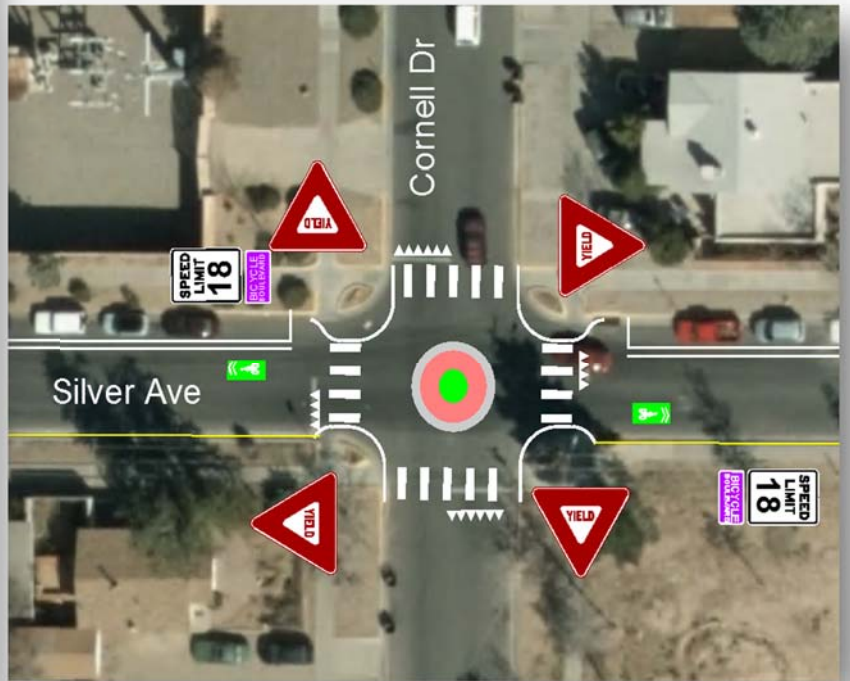


Figure 13 Traffic Circle at Silver/Cornell

Girard Boulevard Crossing

A bike-permeable median diverter should be constructed at the Girard Boulevard crossing as shown in Figure 14. This limits motor vehicle movements to right-in/right-out onto and off of Silver, northbound and southbound through movements on Girard, and southbound left turn movements from Girard onto Silver.

The standard major crossing street signing and striping should be placed to warn drivers on both the northbound and southbound Girard approaches to the Silver bike boulevard.

In final design, the precise locations of the raised medians will need to be carefully considered to best accommodate the needs of both bicyclists taking refuge in the center of Girard and southbound motor vehicles turning onto Silver Avenue.

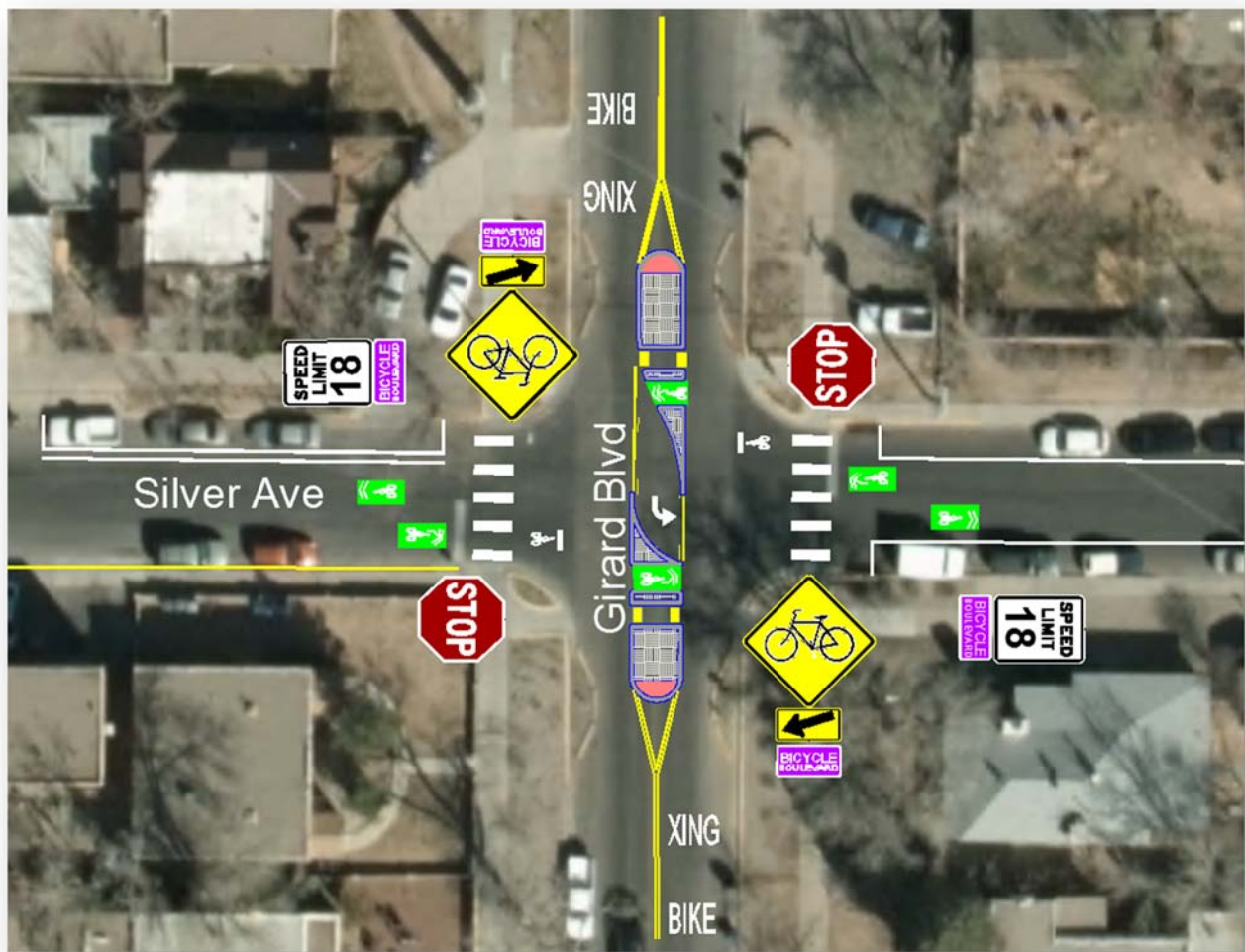


Figure 14 Silver Bike Boulevard Crossing at Girard

Girard to Tulane

Four-inch white pavement markings should be used to designate allowable parallel parking areas on both sides of Silver. Figures 15 and 16 show the typical section and plan view.

The stop signs and stop bars should be removed from the Silver approaches at Richmond (the intersection is currently a four-way stop) so that only Richmond traffic stops.

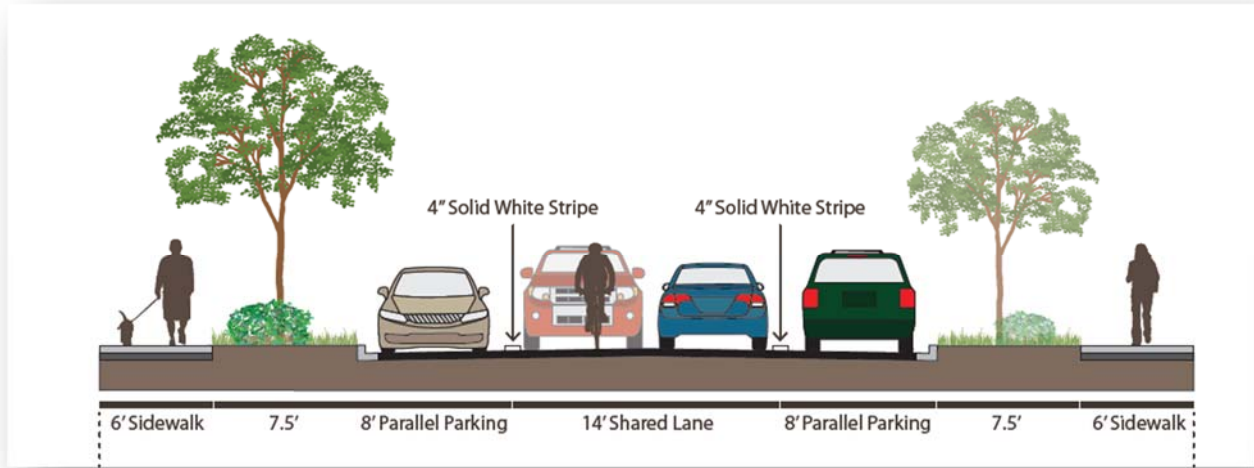


Figure 15 Proposed Typical Section from Girard to Tulane



Figure 16 Proposed Cross Section from Girard to Tulane



Figure 17 Existing Conditions on Silver between Girard and Tulane

Tulane to Carlisle (Nob Hill)

A parking configuration that is growing in popularity around the country is back-in (or “head-out”) angle parking. Back-in angle parking is especially appropriate on roads with bike facilities, because when drivers are leaving their parking space they can see a bicyclist coming towards them. Also, there is no longer the issue of open car doors blocking the route of a bicyclist, like there is with parallel parking.

A comparison of parking space configurations on Silver between Tulane and Carlisle (Figure 18) shows that by using back-in angle parking along the north side of Silver, and no parking along the south side of Silver, about 38 parking spaces can be striped in comparison to the 35 existing on-street parking spaces along that stretch of Silver.

Because this parking configuration would be new to the Albuquerque area, it is recommended that back-in angle parking be tried as a pilot project, on the north side of Silver between Tulane and Carlisle. Figures 19 and 20 show the typical section and plan view. Through conversations with city engineers who have implemented head-out angle parking in their jurisdictions, the biggest concern with this parking arrangement is that drivers sometimes will pull into a parking space head-first from the opposite direction (in this case, an errant driver would be headed east on Silver and pull head first into a space along the north side of Silver). Signing (examples in Figure 21) and education, as well as enforcement, will be crucial to the success of back-in angle parking.

Construct curb bulbouts at the Silver/Amherst intersection to create narrow crossing areas for pedestrians. Refresh crosswalks in all four directions.



Existing parking on Silver in Nob Hill - 35 legal spaces (red vehicle is parked next to yellow-painted curb)



Parking on Silver in Nob Hill with 60 degree head-out angle parking - 38 legal spaces

Figure 18 Comparison of Parking Spaces on Silver from Tulane to Carlisle

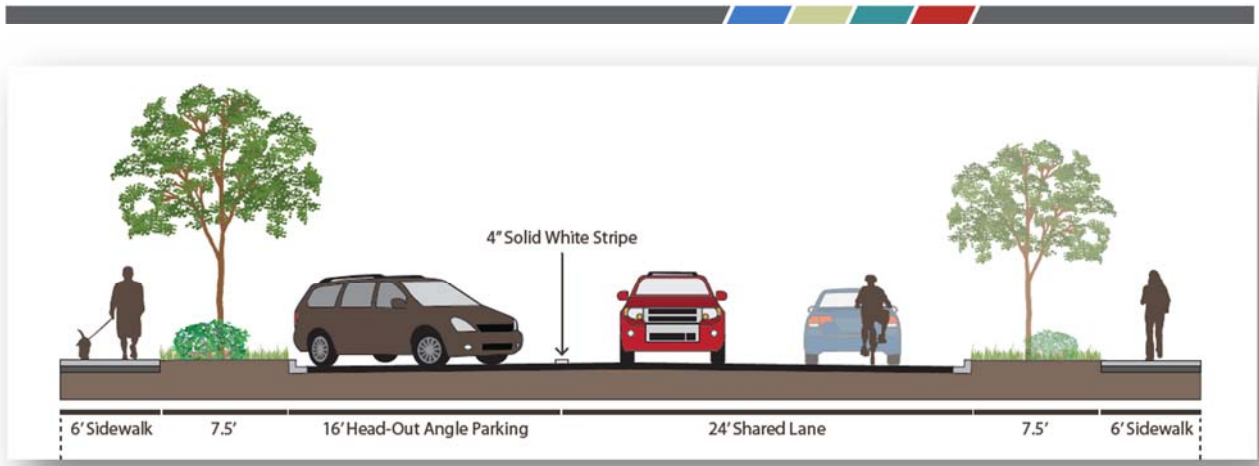


Figure 19 Proposed Typical Section from Tulane to Carlisle



Figure 20 Proposed Plan View from Tulane to Carlisle



Figure 21 Sample Back-In Angle Parking Signs

Carlisle Boulevard Crossing

Where the Silver bike boulevard travels along Carlisle, sign assemblies and pavement markings shown in Figure 23 should be used to guide riders through the offset intersection. Major cross street signing and striping should be placed to warn northbound and southbound Carlisle traffic approaching the Silver bike boulevard.

A 10-foot two-way cycle track should be constructed along the east side of Carlisle between the two approaches of Silver. An example of an off-street two-way cycle track is shown in the Figure 22. As space allows, a separate 6-foot sidewalk should be provided next to the cycle track; however, right-of-way space will have to be assessed to determine if this will be possible.



Figure 22 Example of an Off-Street Two-Way Cycle Track

In addition to the off-street two-way cycle track there was also support for the option along Carlisle in which the center two-way left-turn lane was converted into a two-way cycle track. Vehicle turning left off of Carlisle would have to make turns out of the shared through lane. Because of the driveway conflicts on the west side of Carlisle south of Silver, this option was viewed as inferior to the option of putting the cycle track off-road and to the east, where there are no driveway conflicts.

At the public meeting there was little support for the options that showed directional on-street bike lanes along either side of Carlisle.

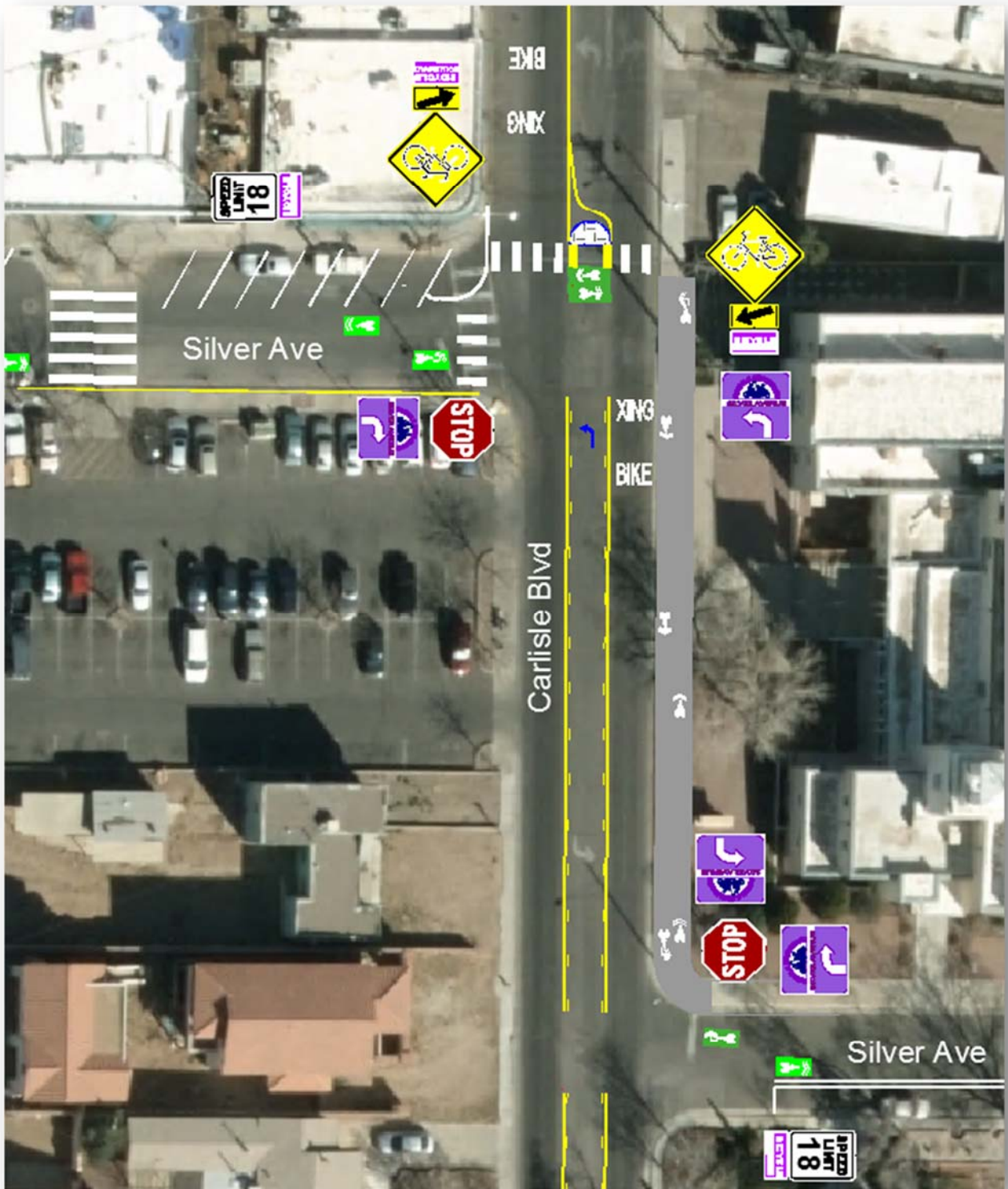


Figure 23 Potential Treatment Option for the Silver Bike Boulevard Crossing at Carlisle Boulevard

Carlisle to Morningside

Four-inch white pavement markings should be used to designate allowable parallel parking areas on both sides of Silver. Figures 25 and 26 show the typical section and plan view. The stop signs and stop bars should be removed from the Silver approaches at Hermosa, Solano, and Aliso and moved to the side street approaches at these three intersections instead.

The Arlote entrance to Silver should be closed with raised curb as shown in Figure 24.



Figure 24 Proposed Closure of Arlote Drive at Silver Avenue

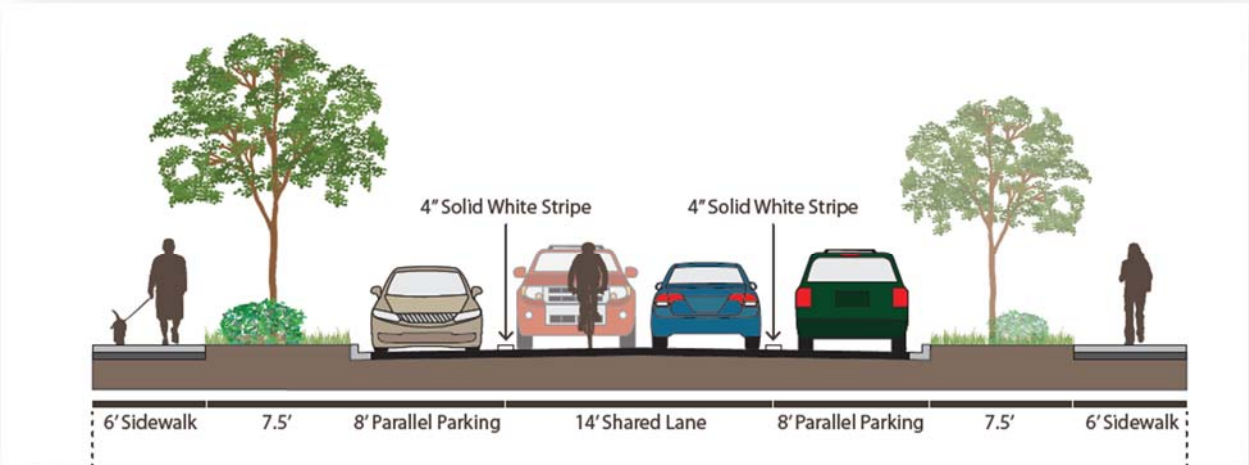


Figure 25 Proposed Typical Section from Carlisle to Washington



Figure 26 Proposed Cross Section from Carlisle to Washington

Morningside Drive Crossing

The Morningside diverter concept should remain in place; however, the curb, signing, and pavement markings should be modified as needed to designate that westbound bicyclists should ride to the left of the raised median as shown in Figure 27.

The sign assembly and pavement markings shown in Figure 28 should be used to guide riders through the offset intersection.

Standard major crossing street signing and striping should be placed on both the northbound and southbound Morningside approaches to warn drivers of the Silver bike boulevard.



Figure 27 Preferred Layout for Diverter on Silver at Morningside

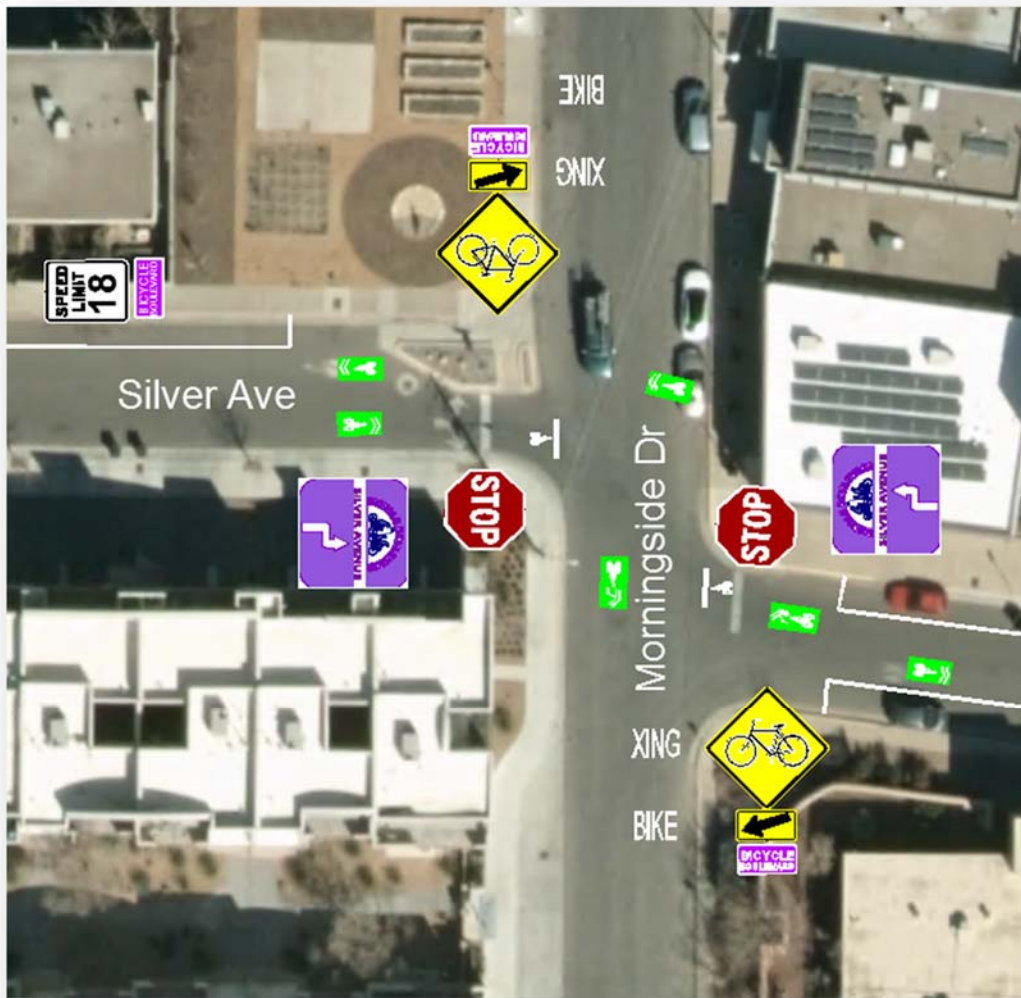


Figure 28 Silver Bike Boulevard Crossing at Morningside

Morningside to Washington

Four-inch white pavement markings should be used to demarcate allowable parallel parking areas on both sides of Silver. Figures 25 and 26 show the typical section and plan view.

The sign assembly and pavement markings shown in Figure 29 should be used to guide riders through route changes along Graceland and Mesa Grande.

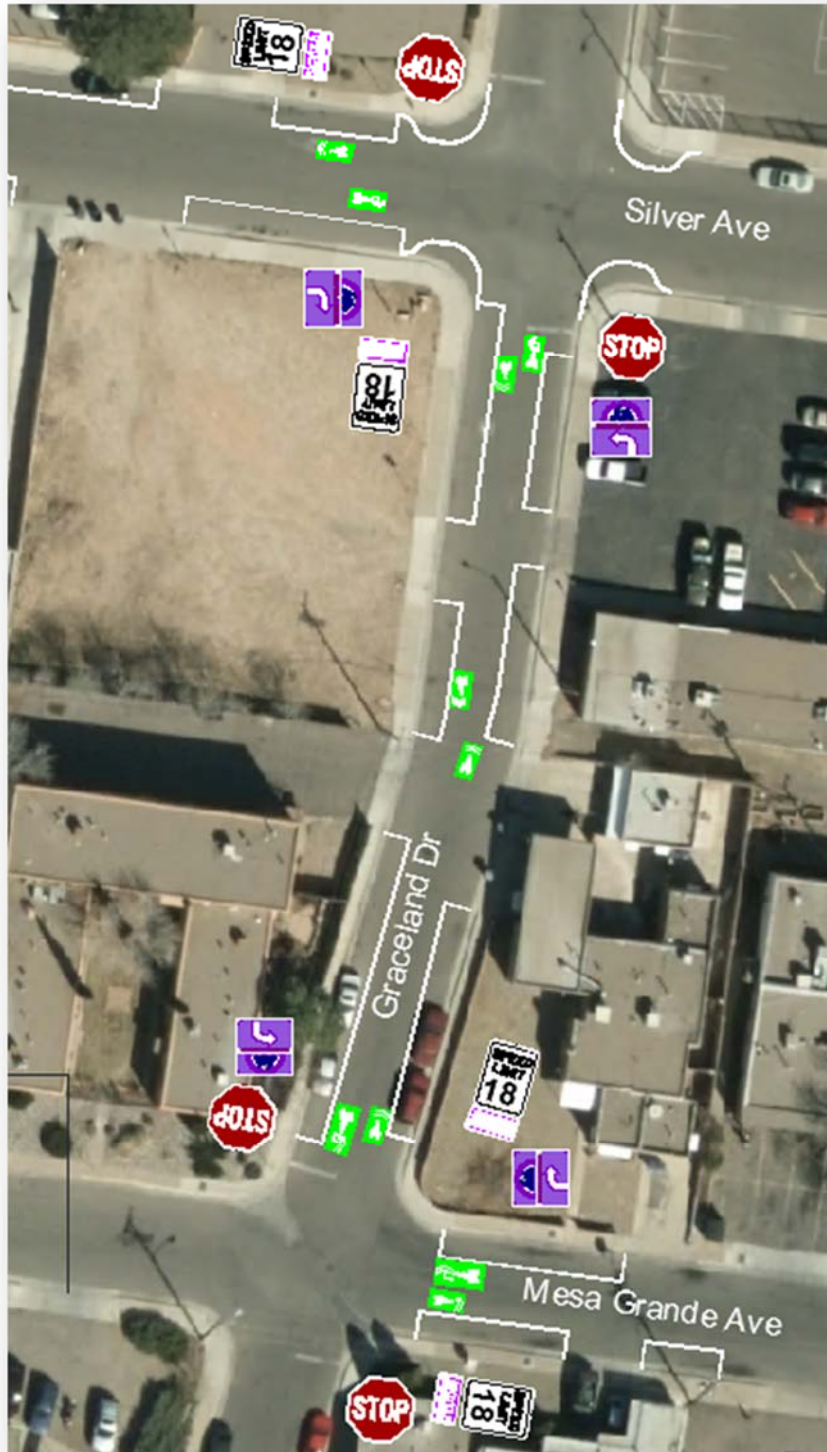


Figure 29 Silver Bike Boulevard along Graceland and Mesa Grande

Washington Street Crossing

A bike-permeable median diverter should be placed at the Washington Street crossing as shown in Figure 30. This limits motor vehicle movements to right-in/right-out onto and off of Silver and Mesa Grande, and northbound and southbound through movements on Washington.

Standard major crossing street signing and striping should be placed on both the northbound and southbound Washington approaches to the Silver bike boulevard.

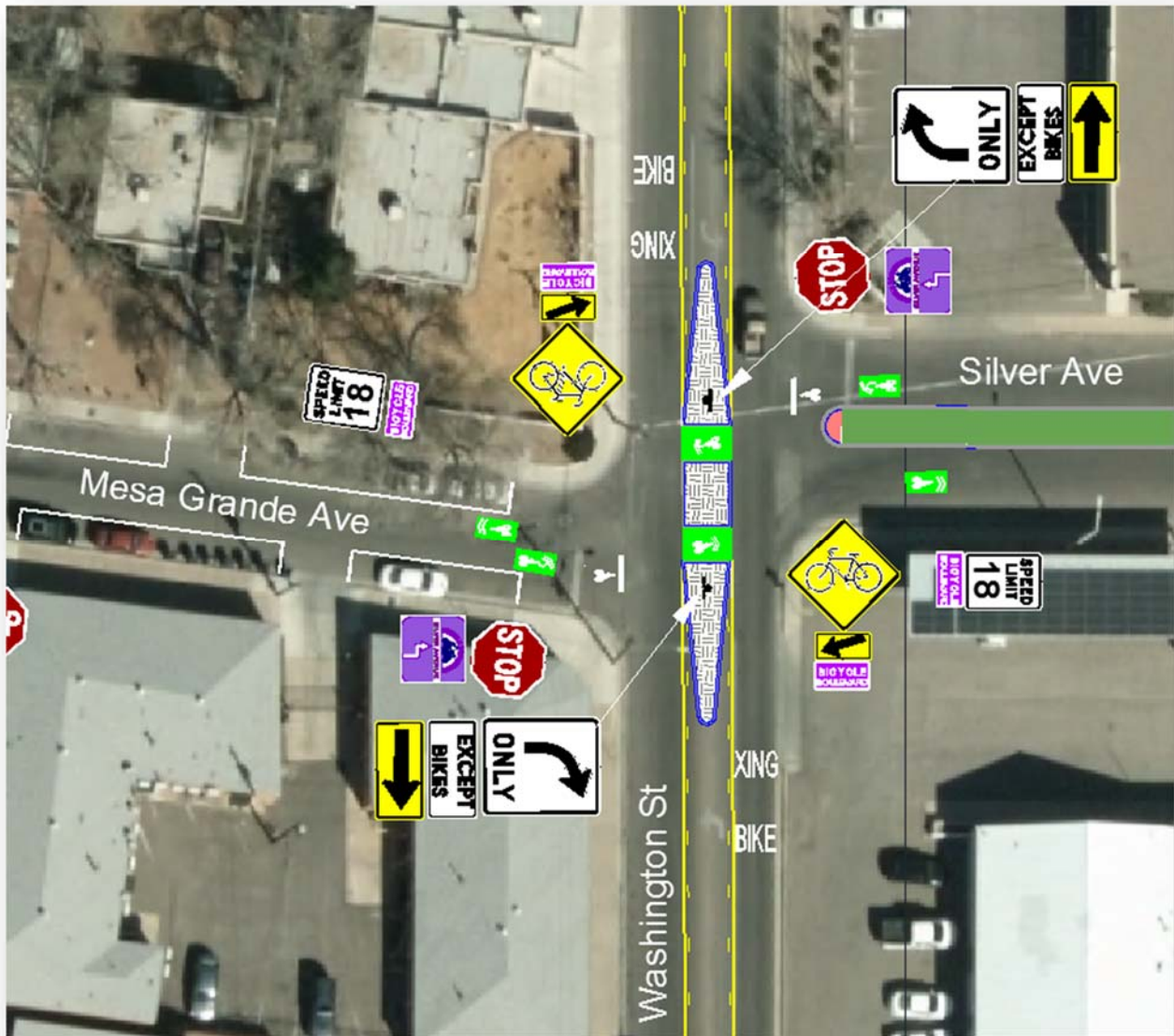


Figure 30 Silver Bike Boulevard Crossing at Washington Street

Washington to Monroe

East of Monroe Street, Silver should not be designated as a bike boulevard (the signing and pavement markings should be removed as well as its designation on any City maps and documents).

For the four blocks between Washington and Monroe a raised median with landscaping should be installed for each block. Full access will be allowed at all cross streets, but there will be no separate turning lanes. Mid-block access will be right-in/right-out only. A typical cross section and plan view are shown in Figures 32 and 33. This portion of the Silver bike boulevard would be similar to what exists now on Silver Avenue west of Buena Vista (Figure 34).

A traffic circle and all-way yield control should be installed at Silver/Monroe (Figure 31). Signs should be used to announce the end of the Silver Avenue bike boulevard and the beginning of the Fair Heights bike boulevard (and the opposite for westbound riders).

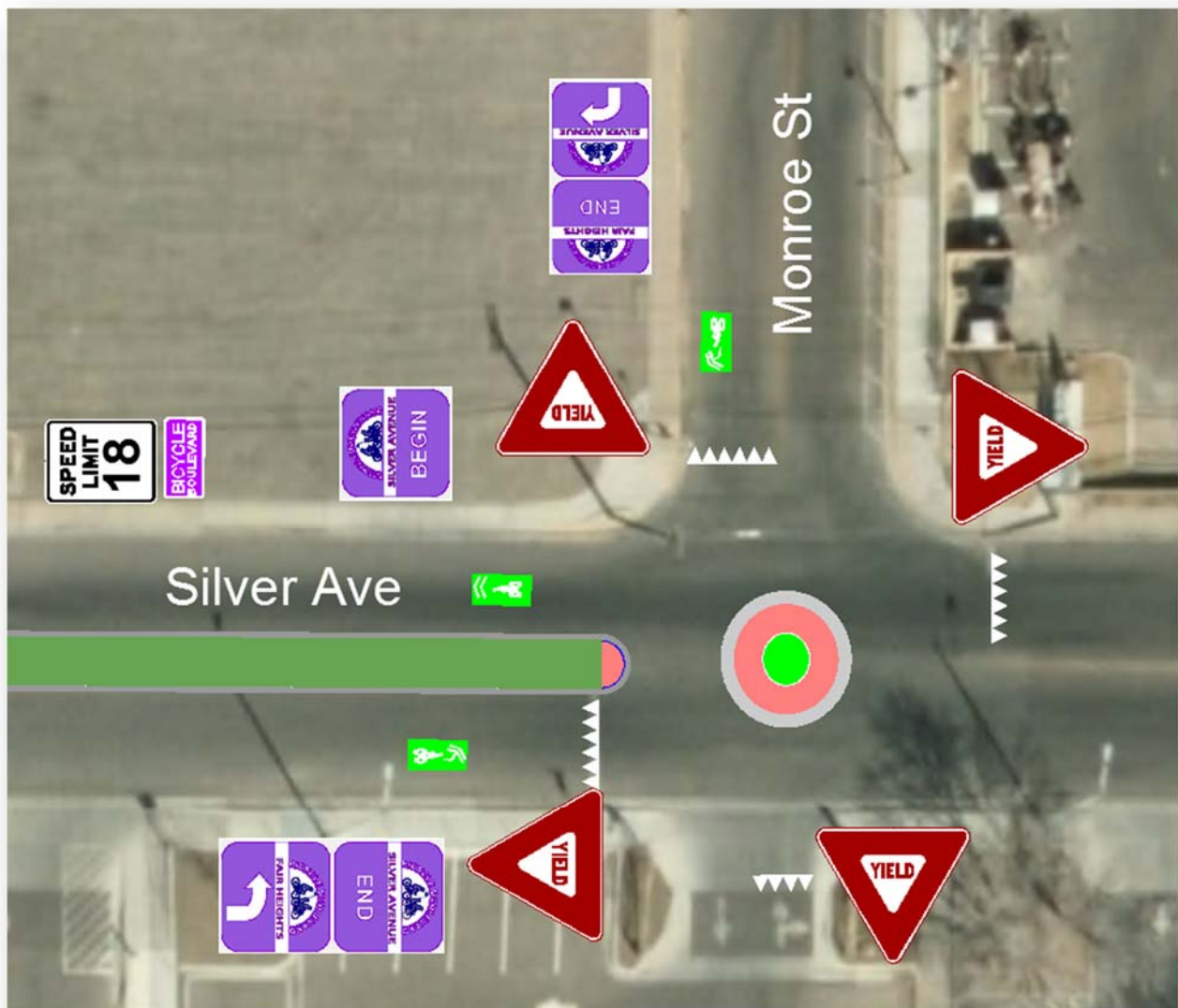


Figure 31 Silver Bike Boulevard End/Fair Heights Bike Boulevard Begin

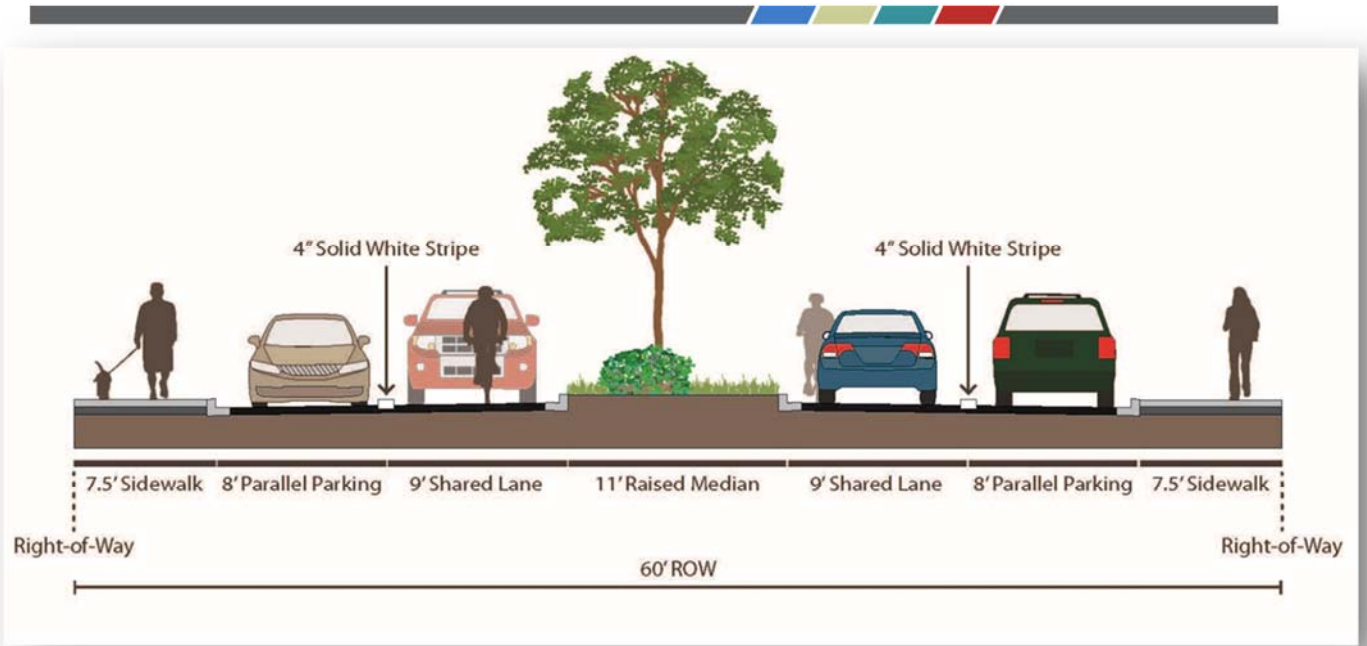


Figure 32 Proposed Typical Cross Section from Washington to Monroe

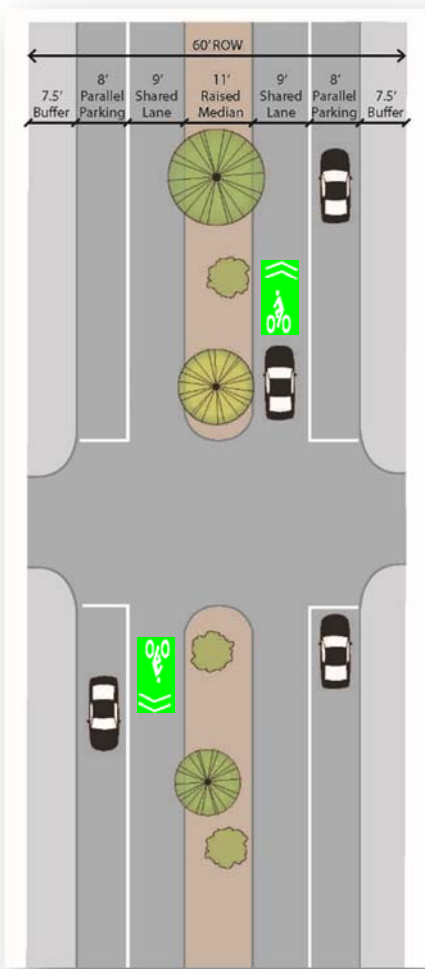


Figure 33 Proposed Cross Section between Washington and Monroe



Figure 34 Existing Silver Bike Boulevard West of Buena Vista

Other Recommendations

In addition to the recommendations for the street described in the sections above, the following recommendations were made and presented to the public.

Lighting

Spot street lighting should be considered where alleys intersect Silver Avenue and residents feel there are safety issues. Pedestrian-scale lighting should be considered all along Silver Avenue. Underlit areas should be considered for additional lighting on a case-by-case basis, rather than increasing lighting levels along the entire corridor.

Skateboarder Use

The City's existing skateboard ordinance on where skateboarders can legally ride is confusing. A few cities in the US recognize skateboarders as bicyclists in the eyes of the law. Revision of the City ordinance should be considered.

Accessibility

If areas are altered by construction as part of this project, the curb ramps must be brought up to current ADA standards.

Parking

On-street parking along many segments of Silver Avenue is not meeting demand. Parking structures should be considered in the area, especially in and around Nob Hill.

PUBLIC INVOLVEMENT

A public involvement meeting was held on September 28, 2015 at Immanuel Presbyterian Church located at the intersection of Silver and Carlisle. Approximately 28 people attended the meeting. Materials related to that meeting are shown in Appendix H. Display boards provided for the meeting were:

- Mounted roll plots of the Silver Avenue corridor showing the draft recommendations for improvements
- A board describing back-in angle parking
- A board presenting options for the segment of the Silver bike boulevard that runs along Carlisle

The meeting began with an open house during which participants could view and make comments on the display boards, followed by a slide show presentation summarizing the existing conditions along Silver and recommended improvements. After a question-and-answer session, participants were able to look at the displays again and ask questions of the project team.

The comments and questions from the public meeting are included in Appendix I. The main themes from the public comments are summarized here:

- Do not remove the all-way stop control as shown in the public meeting displays, especially at Silver/Cornell.
- Do not install any stop signs for Silver traffic between Yale and Girard. Slow down traffic on Silver by building traffic circles and curb bulbouts.
- If traffic circles are used, make them as large as possible.
- Consider improvements for pedestrian crossings of Silver (north-south) as well as along Silver (east-west), especially between Yale and Girard.

-
- Slow down traffic on Silver.
 - Keep in mind that the ART on Central may divert traffic to Silver.
 - Do not prohibit northbound left turns at the Silver/Girard intersection.
 - Build the median diverter as shown at Silver/Girard and place more bike-permeable medians preventing through-moving motor vehicles along Silver
 - Enforce the existing parking laws along Silver.
 - Make use of green infrastructure.
 - Try out the head-out angle parking as a pilot project for a block or two.
 - Remove the existing diverter at Morningside on Silver.
 - Leave in the existing diverter at Morningside on Silver.
 - Eliminate motor vehicle traffic on Silver for some or all blocks, or make Silver a one-way street.
 - Improve the pedestrian crossing of Carlisle at Silver (north leg).
 - Make the recommended improvements at Silver/Arlote.
 - Use the bulbout option to improve sight distance at alleys.
 - Change state law to allow “Idaho stops¹.”
 - If curb bulbouts are used they must be landscaped and maintained.
 - Reverse the direction of stop signs east of Carlisle as shown in the displays (at Hermosa, Solano, and Aliso).
 - Where possible, alternate the side of Silver on which parking is allowed.
 - Install more signs, including “Bikes Allowed Full Lane” and way-finding signs, especially where the route turns. Replace/refresh the purple bike boulevard signs along Silver.
 - Eliminate parallel parking because of the dooring issue, where a driver opens his door into the path of a bicyclists. Alternatively, stripe a “door buffer” adjacent to the parallel parking spaces, but ensure it is not striped to look like a bike lane in which bicyclists are supposed to ride.
 - Consider raised intersections for speed control.
 - Use green pavement color underneath white sharrow pavement markings.
 - Widen the sidewalks all along Silver.
 - Add street lighting at the alleys, and pedestrian scale-lighting along Silver.
 - Add signing and/or pavement markings on Yale, Girard, and Carlisle to indicate the location of the Silver bike boulevard crossing. Pavement striping like University and/or colored and stamped concrete would help.
 - Do not use speed humps/tables. They will add noise, collect trash/water and likely make the area more desirable for skateboarders/bikers to do tricks in traffic.
 - Support for both the off-street two-way cycle track and the center lane two-way cycle track on Carlisle (especially with a physical barrier) between the two approaches of Silver, or a two-way cycle track along the east side of Carlisle with a physical barrier between the cycle track and the driving lanes.

¹The Idaho stop is the common name for a law that allows cyclists to treat a stop sign as a yield sign, and a red light as a stop sign.

FINAL RECOMMENDATIONS AND ESTIMATED COSTS

Based on public input and the input from other City departments, the following changes or additions were made to the initial recommendations. These have been incorporated into the Recommended Improvements section earlier in this report.

- DMD had concerns that the southbound left-turn queue from Yale onto Silver could be adversely affected by the median refuge for bicyclists. Accordingly, they requested that these medians be constructed of pinned curb as an interim measure, to test how they will work. Also, DMD requested that the raised median islands be placed on both sides of each bicycle refuge area in the median, rather than just on the outsides.
- DMD and Traffic Engineering requested that advanced stop bars for bicyclists not be used.
- Changes to stop sign configurations – instead of a traffic circle with four-way yield at Stanford and no other control on Silver between Yale and Girard, the revised recommendation based on public input is to place traffic circles at both the Silver/Cornell and Silver/Princeton intersections with yield signs on all approaches to these two intersections.
- Choice for Carlisle configuration – at the public meeting, several alternatives were presented for the portion of the Silver bike boulevard that runs along Carlisle, rather than one recommended option. All of the public comments showed a preference for a two-way cycle track option rather than directional on-street bike lanes on either side of Carlisle. The recommendation is for a two-way off-street cycle track on the east side of Carlisle, with a separate sidewalk as right-of-way allows.
- While a marked crosswalk was shown on some displays across Carlisle Boulevard at Silver, DMD and City Traffic Engineering were uncomfortable striping the uncontrolled location. The crosswalk was removed from the recommended plans. In the future, the City may consider a marked crosswalk with additional treatment such as a rectangular rapid-flashing beacon (RRFB).
- The recommendations presented to the public did not show new crosswalks for north-south traffic across Silver at any locations between Yale and Girard – the area with the most pedestrian activity. Striped crosswalks have been added at all four approaches at the traffic circles at Silver/Cornell and Silver/Princeton.
- The public input on back-in (head-out) angle parking was overwhelmingly positive. However, because of its newness the recommendation is to try it in a limited area (on the north side of Silver between Tulane and Carlisle) as a pilot project first. In all other locations where back-in angle parking was shown as an alternative, parallel parking is the recommendation until the pilot project is complete.
- At the public meeting several people mentioned the use of “green infrastructure” – stormwater management systems that mimic nature by soaking up and storing water. Accordingly, an additional recommendation is that green infrastructure should be considered during the design process.
- At the public meeting, where parallel striping was shown with a door buffer, the door buffer consisted of two parallel white stripes. A member of the public pointed out that this could be confusing to bicyclists and might actually make them think that this two-foot space is where they are supposed to ride, rather than the opposite. As a result, a recommendation is that a door buffer area that is striped with two parallel stripes should also have diagonal striping within it to denote that it is an area not to be ridden in.

- The recommendation to remove the four-way stop at Silver/Amherst was retracted. There was concern from members of the Steering Committee that it would be too difficult to turn off of Amherst if Silver traffic did not stop (the intersection is in the busy parking area of Nob Hill). The intersection should remain a four-way stop; however, the supplemental plaques on the stop signs should be changed to read “ALL WAY” in accordance with the MUTCD.

An estimate of costs was made for all of the recommendations presented in this report. These are presented below.

Table 5. Estimate of Costs for Recommended Improvements (DRAFT)

Improvement	Estimated Cost of Improvements
Yale to Carlisle	
Crossing improvements at Yale Boulevard	\$30,000
Recommended signing and pavement markings between Yale and Carlisle	\$100,000
Traffic circles at the Silver/Cornell and Silver/Princeton intersections	\$40,000
Crossing improvements at Girard	\$50,000
Silver bike boulevard improvements along Carlisle Boulevard	\$40,000
Design of the above (10%)	\$28,000
Survey for the above	\$10,000
TOTAL, Design and Construction	\$315,000
Carlisle to Monroe	
Recommended signing and pavement markings between Carlisle and Monroe	\$60,000
Crossing improvements at Washington	\$60,000
Raised medians from Washington to Monroe	\$200,000
Traffic circle at the Silver/Monroe intersection	\$20,000
Design of the above (10%)	\$34,000
Survey for the above	\$15,000
TOTAL, Design and Construction	\$389,000
Bumpouts at all intersection corners from Yale to Monroe	\$350,000