## Appendix B: Issues and Suggestions

# Appendix B: Issues and Suggestions

**Issue 1: Lack of Continuity and Connectivity**

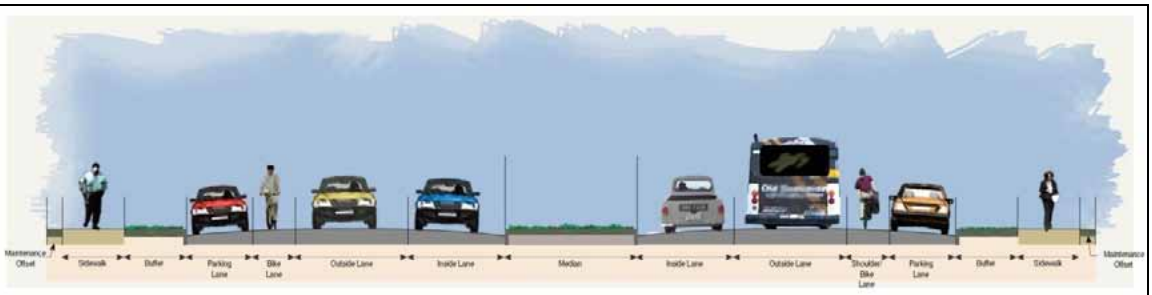
***Gaps in sidewalks on Broadway:*** *Lack of continuous sidewalks along Broadway puts pedestrians in conflict with vehicular and bicycle traffic: Gaps in the sidewalk are illustrated in Appendix A.* The commercial and residential developments and bus stops on this section of Broadway generate high volumes of pedestrian traffic. Worn paths at locations where the sidewalks are missing are clearly evident that pedestrians use landscaped areas and collision data and observations made by the RSA team support that pedestrians use shoulders for walking.

**Suggestions:** *Intermediate-* Install sidewalks to fill gaps at all locations identified in Appendix A, with priority to areas where pedestrians have to walk along the highway (as opposed to in a parking or landscaped area). Installing sidewalks to prevent pedestrians from walking along the highway can result in collision reductions of 89% according to FHWA-SA-07-015. Consider also leaving a grass planted buffer strip between the sidewalk and the highway. This can positively enhance perceived and actual pedestrian safety.

*Long-term-* All pedestrian facility upgrades on this section should consider the urban nature of this section of highway and should coordinate with the long-term plans for the corridor. Some of these issues may be addressed in the feasibility study to be conducted by Caltrans. Upgrades could include streetscaping projects that would create an urban highway cross section with sidewalk and curb and bike lanes. An urban cross section may help increase driver expectancy of the presence of pedestrians and bicycles and control vehicle speeds.

On the west side of Broadway the sidewalk ends between the Pierson's Entrance and the K Mart Entrance. After passing this point, pedestrians walking southbound (towards K Mart) will then be walking on the shoulder in the same direction of traffic, which is not the recommended practice. Furthermore, they will be sharing the road with bicyclists, who will also be approaching from behind the pedestrians. Residents had expressed their concern over this connection to the RSA team.

View of distinct pedestrian path between Sunset St and the Pierson's signal on the east side of Broadway where there is a gap in the sidewalk.




A long-term plan for the corridor should consider features such as continuous sidewalks, buffers between sidewalks and the highway, bike lanes/shoulders, and possibly landscaping I the median to allow refuge areas to be constructed at pedestrian crossings. Design of the median should consider frequent gaps for left-turning vehicles and access between the northbound and southbound lanes for EMS vehicles. Trees can be planted in the buffer strip to further buffer pedestrians from traffic. These cross section elements may help to increase driver expectancy of pedestrians in the area and also help to control vehicle speeds.

***Lack of continuity across side streets:*** *Some side street crossings are discontinuous with sidewalks along Broadway.* These discontinuities include design elements such as absence of marked crosswalks, missing or outdated curb ramps, and pedestrian paths that are not direct at crossings. These conditions may result in the following safety issues:

- Pedestrians may take paths that conflict with vehicular traffic.
- Drivers may not expect pedestrians to be crossing.
- Pedestrians with mobility restrictions and older pedestrians may not be able to reach desired destinations.

**Suggestions:** Consider installing painted crosswalks at the following streets along the corridor:

- Tomlinson St.
- Truesdale St.
- Highland Ave.
- Del Norte St.

In addition, at each of these crossings (detailed drawings in Appendix C):

- From side street - Ensure traffic control devices are used that separate conflict points between motorists and pedestrians (such as stop bars and signs).

View of Del Norte St. looking south. The extremely wide crossing offers very few cues to motorists to look for crossing pedestrians or bicyclists. Furthermore, pedestrians walking along Broadway and crossing at this intersection may have to walk behind stopped vehicles because of the stop bar placement and intersection skew.

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| • From Broadway - Ensure curb radii are appropriate for traffic speeds entering residential areas.<br>• All- Ensure ramps align with crosswalks and sidewalks and follow direct paths. | |

**Issue 2: Long Distances between Crossings**

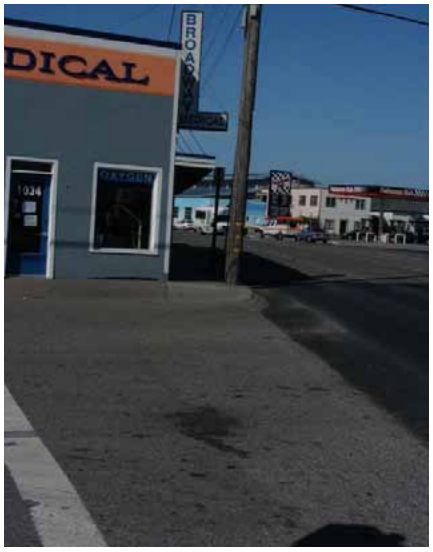
**Safety Issue Description:** The average distance between crossing locations on Broadway is greater than 1000 feet, which appears to be leading to undesirable pedestrian and bicycle actions. There are a high number of midblock pedestrian and bike crossings on Broadway (i.e., pedestrians and bicyclists are crossing between intersections where there are no formal pedestrian crossings). The long distances between crossings also results in bicyclists driving in the wrong direction on the shoulders. Pedestrians and bicyclists are performing these midblock crossings and wrong-way maneuvers to access bus stops, convenience stores, and residential properties. Drivers may not expect pedestrians and bicyclists to cross at these locations which may increase the likelihood of a collision. Factors that may affect pedestrians' decisions to cross midblock include the following:

A pedestrian waits in the painted median just north of Clark St.

A bicyclist seizes a gap in traffic to cross the street near Del Norte St.

- *The location of pedestrian desire lines:* Pedestrian "desire lines" are the preferred paths of pedestrians in a highway network. Pedestrian desire lines often trace the shortest or most convenient paths between two points. For example, south of Wabash Avenue (and south of Del Norte St. on the west side), pedestrian desire lines seem to extend between the bus stops located on both sides of the highway. Pedestrians were observed crossing midblock after disembarking at the bus stops located on both sides of Broadway. In this area south of Wabash Avenue, there were nine reported pedestrian and bicycle collisions. The closest signalized crossing is at Wabash Avenue, which is approximately 350 feet away. Furthermore, there is no crossing on the south leg of Wabash Avenue the intersection, requiring pedestrians to cross four approaches just to get to the other side of the street. The RSA team performed this crossing maneuver, which took nearly 10 minutes. Other locations where pedestrian desire lines extended across Broadway where there were no formal crossings include:

- Between McCullens Ave. and Truesdale St.- There are numerous pedestrian traffic generators in this area and pedestrians can be seen frequnetly crossing Broadway all along this section of the highway. This location also has multiple driveways, skewed and offset intersections, a wide shoulder adjacent to the northbound lanes, and bus stops. The elements can create confusing traffic patterns for all modes of travel. For example, Truedale St. and Highland Ave. are offset intersections. This configuration "spreads" conflict points along a longer stretch of the highway than intersections with the streets aligned. Pedestrians and bicyclists are especially vulnerable here as not only is the intersection near non-motorized travel desire lines across Broadway, there are multiple driveways in this section of the road exposing pedestrian and bicyclists to multiple conflicts walking or riding along the road. Motorists too are subject to multiple conflicts. Left turning traffic into Truesdale St. and Highland Ave. actually follows overlapping paths in the center lane.
- North of W. Harris St.- Pedestrains were seen crossing north of W. Harris St. to the shopping center on the west side of the highway. There is no marked crossing on the north side of the intersection and a crossing at that location may not follow many pedestrain desire lines.
- Near Clark St.- Pedestrians were seen crossing Broadway in both directions. The horizontal curve to the north and the proximity of the building on the northwest corner of the intersection restricts sight distance for southbound traffic approaching Clark St.




Limited sight distance in the northwest corner of the intersection of Broadway and Clark St.

- *Distance between marked crossings:* As the distance increases between marked crosswalks, pedestrians and bicyclists are more likely to cross midblock rather than travel out of their way to cross at a designated crossing. A recent study of pedestrian travel preferences supports this behavior. Schlossberg et al. (2007) conducted a spatial analysis of pedestrian travel preferences and found that pedestrians' primary consideration in choosing a route is minimizing time and distance.

  This behavior is further supported by a National Cooperative Highway Research Program (NCHRP)/Transit Cooperative Research Program (TCRP) report that looks at improving pedestrian safety at unsignalized crossings. Part of the report addresses the adequacy of pedestrian signal warrants through several research methodologies including an on-street survey. Part of the survey asked pedestrians "if this crossing was not here, would you walk to the next intersection?" At the majority of the sites, only 25 percent of the respondents would walk to a signalized intersection that was located at 550 ft (168 m), 950 ft (290 m), or 1000 ft (305 m). For one of the sites, only about half of those surveyed responded that they would walk to a signalized intersection only about 200 ft (61 m) from the crossing. It is important to note, that

several of the respondents answered "yes" to a question regarding how far they would be willing to walk and then commented that they walk to the nearby crossing "most of the time" or "sometimes" depending upon the weather or other factors.

The distance and associated walking times between the signalized intersections with crosswalks are shown in Appendix A. Walking times are estimated using walking speeds of 4.0 feet/second and 3.5 feet/second. The Manual on Uniform Traffic Control Devices (MUTCD) currently recommends a walking speed of 4.0 feet/second. However, the National Committee on Uniform Traffic Control Devices (NCUTCD) recommends reducing the assumed walking speed to 3.5 feet/second. Recent research, including the AAA Pedestrian Signal Safety for Older Persons study, supports this research. These slower speeds would accommodate older pedestrians without causing significant increases in delay for vehicular traffic. Therefore, both times, the current 4.0 and proposed 3.5 feet/second were used in this analysis.

**Table B.1. Distance and Walking Times between Signalized Intersections with Crosswalks**

| Signalized Intersections with Crosswalks | Distance to Next Signalized Intersection Crosswalk (ft) | Estimated Walking Time (min) | Estimated Walking Time (min) | Number of Pedestrian Collisions |
|---|---|---|---|---|
| | | 4.0 ft/sec | 3.5 ft/sec | |
| 6th Street | 272 | 1.1 | 1.3 | 0 |
| Washington Street | 1,611 | 6.7 | 7.7 | 6 |
| 14th Street | 1,033 | 4.3 | 4.9 | 3 |
| Wabash Avenue | 3,400 | 14.2 | 16.2 | 12 |
| Henderson | 1,903 | 7.9 | 9.1 | 1 |
| N. Bayshore Mall | 1,175 | 4.9 | 5.6 | 6 |
| S. Bayshore Mall | 843 | 3.5 | 4.0 | 8 |
| McCullens | 2,037 | 8.5 | 9.7 | 5 |
| Pierson's Entrance | 1,509 | 6.3 | 7.2 | 4 |
| K-mart Entrance | -- | -- | -- | -- |
| **Average** | **1,531** | **6.4** | **7.3** | **4.5** |

The signalized intersections with crosswalks along this segment are 1,531 feet apart on average. This distance correlates to a walking time of more than six minutes between intersections not including the time required to cross Broadway, side streets, or driveways. The largest distance between crosswalks is more than double the average at 3,400 feet, which corresponds to walking times between 14.2 and 16.2 minutes. This segment also corresponded to the highest number of pedestrian collisions. Conversely, the intersection with the lowest number of pedestrian collisions (6th Street) is associated with the shortest distance to the next crosswalk (272 ft).

Similar crosswalk spacing in denser areas will provide greater access to pedestrians and bicyclists across Broadway and encourage crossing at designated crossings.

- *Perceived safety of crossings:* The RSA team observed several conflicts between vehicles and pedestrians crossings in the study area, which may contribute to the perception that an intersection is "unsafe" for pedestrians and bicyclists. Intersection characteristics that may contribute to this perception include the following:
    - *High-speed right turning traffic:* Right turn channelized islands are designed so that drivers focus their attention to the left to look for gaps in traffic. This means the drivers will be looking away from pedestrians when they are trying to cross an intersection from the right of the driver. Furthermore, curb radii are large enabling vehicles to make faster right turns.
    - *High-speed left turning traffic:* Many signalized intersections in the study area have permissive left turn phasing. Permissive left turns often conflict with the pedestrian WALK phase (e.g., Wabash Ave.). Driver's primary focus is on trying to find a gap in approaching traffic, not looking for pedestrians in the crosswalk.
    - *Inadequate pedestrian waiting areas:* Pedestrian waiting areas at some intersections are extremely limited and may have no curb ramps or cut-throughs for pedestrians.

Furthermore, the signal cycle length at Broadway and Wabash Ave. is long as discussed previously, which may discourage crossing at the traffic signal.

**Suggestions:**

*Short-term to intermediate:*

*Install additional crossings across Broadway*: As Table B.1 suggests, the most critical gap where pedestrians and bicyclists are offered few crossing options is between Wabash Ave. and Henderson St. Other areas where pedestrian and bicycle crossings are desired can be determined from the collision analysis described in Section 2.3 and the observations of the RSA team. Based in these data, consider installing crossings at the following locations:

- North of W. Harris St.
- At Hawthorne St.
- At Clark St.

Pedestrian/bicycle crossings at intersections may be incorporated into signalizing the intersection, such as at Hawthorne St. and Clark St. Warrants for the 2009 MUTCD should be consulted, which has lower pedestrian threshold volumes for higher ADT roadways. Potential midblock crossing treatments include:

- Pedestrian/bicycle crossing island with flashers and advanced warning lines.
- Pedestrian/bicycle crossing island with stutter flashers (a.k.a., the Enhancer) and advanced warning lines.

- HAWK signal.
- Two-stage signalized crossings.

*Consider placing median islands along Broadway*: A median should be considered along other sections of Broadway, especially where midblock pedestrian or bicycle collisions occur. FHWA-SA-07-015 states that pedestrian collisions can be reduced by 46% if a raised median is added to a marked uncontrolled crossing and pedestrian collisions can be reduced by 39% if a raised median is added at an unmarked crossing. One location where a median/median islands will enhance safety is the section of highway between McCullens Ave. and Truesdale St. (see Appendix C for details). One short median can be placed next to the Boiler Room where pedestrians frequently cross Broadway. Another can be placed between Truesdale St. and Highland Ave. This will eliminate the left turn head-on conflict and enable better defined turning movements. Space can be used to provide a refuge island that can be used by pedestrians and bicyclists.

*Relocate Bus stops south of Wabash Avenue:* These bus stops were observed to be one of the primary causes of pedestrian midblock crossings in this area. Moving the bus stops closer to the intersection will encourage transit riders to use the crosswalks. However, improvements should be made to the intersection at Wabash Avenue before the bus stops should be relocated to ensure pedestrian collisions do not increase at the intersection.

*Conduct a safety campaign with improved facilities*: As major improvements are made, such as adding a crossing across Broadway, messages should be aired in English and in Spanish to alert the public of the improvements and encourage their proper use.

*Long term:*
*Consider streetscaping:* Streetscaping provides a more amiable environment for pedestrians and bicyclists and also provide a positive buffer between pedestrian and vehicular traffic. Ultimately, a uniform urban cross section is desirable in the study area. An urban cross section with streetscaping may help to increase driver expectancy of pedestrians in the area and also help to control vehicle speeds.

**Issue 3: Access Control**

***High number of access points:*** *A lack of access control in the study area creates many conflict points between motor vehicles and pedestrians and bicyclists.* These access points interrupt the sidewalk at frequent intervals, negating much of the function of the sidewalk as a dedicated pedestrian zone. Of primary concern are access points near intersections. These have more conflicting traffic and thus can create more distractions for drivers. Furthermore, the proximity of access points to the intersection may promote cut-through traffic.

**Suggestions:** Consider consolidating access points, especially at or near intersections. Specific areas that were identified in the study area include (see Appendix C):

- AT&T store along northbound Broadway at McCullens Ave.
- Motel at W Henderson St. in the northbound direction.
- Patriot Gas Station at Wabash Ave. in the northbound direction.
- Deals on Wheels at 14th St. in the southbound direction.
- Access near the Pierson's signal (most businesses have access through the signal).

Access to the Patriot Gas Station at Wabash Ave. is barely separated from the intersection. In addition to conflicts with pedestrians walking along the sidewalk, the proximity of the access may increase conflicts with pedestrians or bicyclists waiting to cross.

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| ***Design of access points:*** *Several access points in the study area were identified as being too wide.* Wide access points encourage higher speed conflicts between motorists and non-motorized users and provide a longer stretch of highway without a sidewalk. Furthermore, there is less predictability as to where motorists and non-motorized users may be traveling when space is not clearly marked. As a result, expectancy of non-motorized users is lower, increasing the risk of a collision.<br><br>**Suggestions:** Consider reducing the width of access points and adding appropriate traffic control. This will encourage drivers to slow down as they approach the access points. Consider these modifications at the following access points:<br>• The 76 Gas Station near Pierson's.<br>• Performance Tires near Clark St.<br>• Specialty Traffic Systems near Hawthorne St.<br>• The car wash near the 76 Gas Station. | <br>This wide access point in front of Specialty Traffic Systems near Hawthorne St. allows vehicles to make wider and higher-speed turns when entering or exiting the parking area. The photo also illustrates how sidewalk is missing along a substantial length of highway when access points are too wide. |
| ***Lack of delineation between sidewalks and parking areas:*** *In some areas, it is difficult to distinguish the difference between sidewalks and driveways.* Motorists and pedestrians are less aware of each other, potentially causing a conflict.<br><br>**Suggestions:** Remove or modify the parking in areas where vehicles may back over pedestrian paths. Specifically, in front of the Boiler Room install curbs or raise sidewalks to make vehicle intrusion onto the | <br>Motorists utilizing the parking in front of the Boiler Room were observed to back over the sidewalks onto Broadway as they were trying to leave the premises. Pedestrians and |

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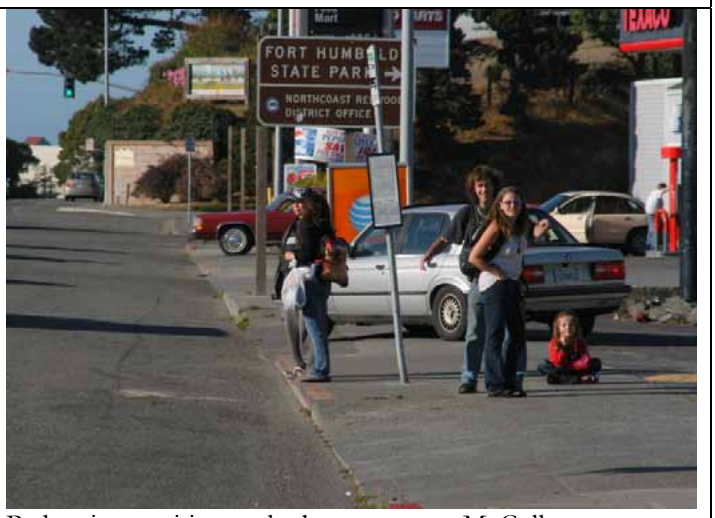
| sidewalks more difficult and less likely. Pave sidewalks and highway surfaces with different colors to highlight the presence of pedestrians to drivers and vice versa. | bicyclists must be wary of backing and entering vehicles, while drivers may not always be expecting pedestrian traffic in the "driveway" of a business. |
| ***Limited waiting areas at bus stops:*** *Cars parked in front of the AT&T store near McCullens Ave. were observed to backup towards transit riders waiting at the bus stop.* Lack of delineated space assigned to waiting bus passengers may cause more frequent conflicts between pedestrians and drivers.<br><br>**Suggestions:** *Short-term:* Provide delineators or a barrier between the parking area and the bus stop near McCullens Ave. Delineators, such as post-mounted delineators, are effective but often discouraged for pedestrian control because of their appearance. Jersey-style barriers are the most effective, but also are not popular because of their appearance. Barriers, such as a quick curb, are often more acceptable means of providing separated pedestrian space. |  <br>Pedestrians waiting at the bus stop near McCullens are afforded little protection from vehicular traffic. While the location of the bus stop is good in relation to the intersection, the presence of the access points on either side and the parking area (to the right of the photo) increases the risk for pedestrians waiting at the stop. Children, such as the one in the photo, would be difficult for backing vehicles in the parking lot to see. |

**Issue 4: Safety Issues for Bicyclists**

***No dedicated bicycle facilities****: There is a high amount of bicycle traffic in the study area. Shoulders, where present, along Broadway are being used by bicyclists as are sidewalks at times.* Without dedicated facilities, bicyclists have to ride in the vehicle travel lanes, on sidewalks, or through parking areas. When bicyclists have no dedicated facilities they travel in unpredictable paths which may lead to frequent and unexpected conflicts with vehicles and pedestrians. There was one fatality involving a bicyclist biking on the shoulder (in the correct direction) near Sunset Dr.

**Suggestion:** *Intermediate to long-term:* Create continuous bicycle facilities using:

- Marked bike lanes 5' – 6' wide (south of Wabash Ave.)
- Alternate parallel paths to Broadway where ROW is not sufficient (north of Wabash Ave.)

Ensure bike lanes are consistent with the detailed cross-section concept for the entire corridor (see Issue 1).

Include a public awareness and safety campaign with the opening of these facilities.

This bicyclist is traveling in a shoulder that becomes a right turn-only lane. Frequent access points will cause frequent conflicts with vehicles. The bicyclist will have difficulty merging with vehicle traffic when the right turn lane ends.

***Frequent wrong-way cyclists:*** *A high number of bicyclists were observed to ride against the traffic in the shoulders.* This can be particularly dangerous as motorists turning right out or left into a driveway are focused on finding gaps in vehicular traffic approaching from the opposite direction and may not see a bicyclist traveling in the wrong direction. The collision data also shows that this is a major problem on the corridor. One of the potential causes of wrong-way riding may be because the long distances between crossings and fewer crossing opportunities along Broadway creates a condition where there are not convenient paths.

**Suggestions:** Consider creating more frequent crossings as described in Issue 2 and dedicated bicycle facilities as described previously in Issue 4. Also, consider the following tools to promote proper use of existing to newly engineered facilities (start with existing facilities and update as new facilities are constructed):

- Way finding signing to help direct bicyclists to dedicated facilities.
- Education of safe riding practices to increase awareness of hazards.
- A map of bicycle routes, which will be developed as part of the feasibility study for Broadway.

A photo of bicyclists riding northbound on Broadway against traffic. The RSA team observed a large number of bicyclists riding against traffic on Broadway during all hours. Furthermore, a review of the collisions along the corridor revealed that at least seven of the bicycle-vehicle collisions involved a bicyclist traveling against traffic.

***Conflicts at acceleration lanes:*** *At two intersections on the southern end of the corridor (the Kmart signal and the Pierson's signal), acceleration lanes are provided on Broadway to improve capacity of the intersection. This creates a conflict between the through cyclists and traffic attempting to enter the through lanes on Broadway.* Bicyclists have difficulty merging with higher-speed vehicle traffic at these locations because they are typically travelling at slower speeds and have a narrower profile, making them more difficult to be seen by accelerating/merging traffic.

**Suggestions:**
*Intermediate*: Consider eliminating the acceleration lanes and creating 5'-6' wide bicycle lanes where possible. It appears that the acceleration lane at Pearson's may be removed with little operational impacts (see Appendix C), however, there may be more significant operational concerns at the Kmart signal, which should be studied.

At the end of this acceleration lane, bicyclists must merge into a through vehicle travel lane. Acceleration lanes may be more appropriate in places where vehicular traffic speeds are higher and bicycle traffic volumes are very low.

**Issue 5: Conflicts at Pedestrian Crossings**

***Vehicles make high-speed turns at channelized islands****: While channelized right turns can enhance pedestrian safety at large intersections by providing pedestrians with refuge, there are channelized islands in the corridor where wide corner radii enable vehicles to make high-speed right turns.* This can expose pedestrians to conflicts with high-speed traffic and make it more difficult for pedestrians to determine when it is safe to cross. Furthermore, the design of these islands makes it difficult for drivers to see pedestrians waiting to cross or in the crosswalk.

**Suggestions:**

*Intermediate/long-term:*

- Use pedestrian countdown signals.
- Use continental/ladder crosswalk pavement markings.

*Intermediate*: At the Pierson's driveway modify right turn channel (see Issue 1 and Appendix C) and move the crosswalk so pedestrians in the crosswalk can be seen more easily by approaching motorists.

The channelized right turn at the Pierson's signal allows vehicles to make high-speed right turns without stopping. Furthermore, obstructions on the corner make it difficult for drivers to see pedestrians starting to cross and for pedestrians to see oncoming vehicles. Finally, no crosswalk is provided at this location.

***Blocked sight triangles****: Sight triangles at several intersections in the study area are obstructed, including:*

- *Northwest corner of Pierson's.*
- *Southeast corner of McCullens Ave.*
- *Northwest corner of Clark St.*

Pedestrians at these locations are unable to see oncoming vehicular traffic and vice versa.

**Suggestions:**

*Short-term:* Place pedestrian signs on mast arms adjacent to signal heads instructing drivers to yield to pedestrians in crosswalks.

*Short-term/intermediate*:

- Add curb extensions to improve sight lines between pedestrians and motorists.
- Redesign intersection geometry at problem locations to include smaller right-turn radii and improved sight distance for pedestrians.

The right-turn radius and the retaining wall along the cross street restrict the sight distance of crossing pedestrians at this location. This is especially dangerous since vehicles turning right on green will be traveling at a high speed and may have little time to a pedestrian crossing in the crosswalk with the WALK signal.

**Issue 6: Conflicts in Two-Way Left Turn Lane (TWLTL)**

***Conflicts in TWLTL**: Pedestrians and bicyclists crossing mid-block due to long distances between crossings were observed to use the two-way left turn lane as a median refuge.* The two-way left turn lane is also used as an acceleration lane by vehicles (permitted by California Law). This creates a major conflict between vehicles and pedestrians and bicyclists.

**Suggestions:**
Consider modifying TWLTL with combination of turn lanes and medians. Install medians at selected locations ensuring that the needed access between the northbound and southbound lanes for EMS vehicles is maintained. Specific locations for median placement include but is not limited to the following locations:

- North of Harris St.
- South of Truesdale St. (see Appendix C).

Medians can be mountable so they can be used by EMS and bicyclists.

Pedestrians and bicyclists cross one side of the busy highway at a time, using the TWLTL as a median refuge. Vehicles using this TWLTL (either as a turn lane or as an acceleration lane) may not expect pedestrians at these un-marked locations.

**Issue 7: Accessibility Restrictions**

***Crossings with limited accessibility****: The following issues were noted at crossings in the study area:*

- *Missing curb ramps or cut-throughs.*
- *Missing tactile warnings.*
- *Insufficient landing space.*
- *Inaccessible pedestrian push buttons.*
- *Improperly aligned crosswalks*

When accessible features are not present, people in wheelchairs, with strollers, or with other mobility restrictions may find it necessary to travel in the street away from crosswalks. People with vision impairments may not know where to cross the street.

**Suggestions:**

*Short-term:*

- Consider realigning crosswalks so that they follow straight paths (see Appendix C).
- Consider conducting a formal evaluation of ADA compliance. Address issues with maintenance and other projects.

This crosswalk does not cross the street in a straight line. This type of crosswalk is difficult, if not impossible for pedestrians with vision impairments to use because they cannot detect the turn. Installing a raised right-turn channelization island with ADA-compliant curb ramps would provide direction for these pedestrians. Straightening the crosswalk so that opposite curb ramps are connected with a straight line would also make this crossing more accessible.

***Uneven walking surfaces****: There are sidewalks in the study area with uneven surfaces.* Pedestrians with mobility restrictions may avoid or be unable to use sidewalks with uneven walking surfaces. Uneven walking surfaces also present tripping hazards to all pedestrians.

**Suggestion:**

*Short-term*: Check for smooth surfaces on all pedestrian facilities. Repair unsmooth surfaces.

This uneven and poorly maintained sidewalk presents a barrier to pedestrians with mobility restrictions, pedestrians pushing strollers and bicyclists. Accessibility for these pedestrians is either blocked entirely or they are forced to travel in the street.

**Issue 8: Maintenance and Drainage**

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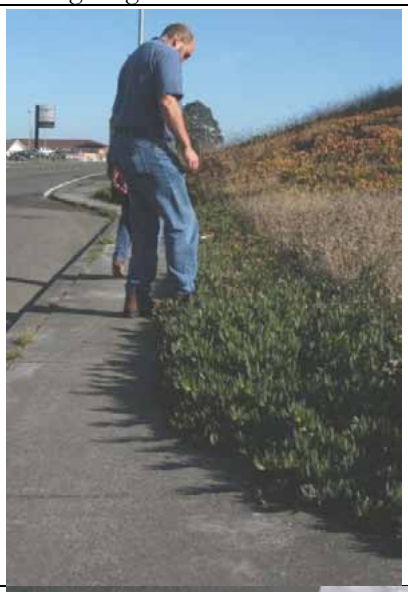
| ***Blocked sight triangles****: Sight triangles at several intersections in the study area are obstructed due to foliage.* This can block pedestrian's views of oncoming traffic at crossing locations and vice versa.<br><br>**Suggestion:** *Short-term:* Trim foliage to improve sight distances. | <br>Foliage at Truesdale blocks sight triangles for both pedestrians trying to cross the street and vehicles making a right-turn. |
| ***Reduced sidewalk width:*** *Over grown vegetation and foliage along side of the sidewalk appears to be protruding into the sidewalk, reducing the effective width of the sidewalk.* This condition can create accessibility issues for pedestrian with mobility restrictions and reduce the capacity of the sidewalk system.<br><br>**Suggestion:** *Short-term:* Trim vegetation to improve the effective sidewalk width. |  <br>Vegetation at this location has encroached on the sidewalk, narrowing its effective width and making it more difficult to use for pedestrians with mobility restrictions and groups of pedestrians. |
| ***Level areas between sidewalk and street:*** *Sidewalks and the road surface appeared to be at the same level in some locations.* This cause serious drainage and safety problems. These areas may be prone to flooding which can cause pedestrians to take unpredictable paths. Furthermore, under these conditions it is easier for vehicles to mount the sidewalk and encroach upon pedestrians.<br><br>**Suggestions:** *Intermediate/long-term:* Build-up sidewalks to reestablish positive drainage. Landscaped buffer strips have the two-fold benefit of separating vehicular and pedestrian traffic and managing water runoff. | <br>The pavement and sidewalk at this location are at the same height. This provides no separation between vehicular and pedestrian traffic. The loss of gutters along the highway results in drainage issues as water from the highway surface collects on the sidewalks. |

**Issue 9: Signage**

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| ***Night time visibility:*** *Street name signs are difficult to see at night due to location and lighting.* Drivers looking for street signs may not notice pedestrians or may make sharp, sudden turning movements when they find their desired street location.<br><br>**Suggestion**: *Short-term:* Move street signs to mast arms and use retro reflective signing. | <br>The street name sign at the intersection of McCullens is barely visible at night and can be especially difficult to see for motorists in motion. |

**Opportunities Beyond Engineering**

Public safety can be improved through education and enforcement measures as well as engineering. Education measures should focus on high-risk groups, such a younger pedestrians and transit users who were seen crossing midblock from bus stops. Improvements should be announced with public service messages. Enforcement campaigns should target areas where pedestrian crashes are most frequent. More information about potential education and enforcement strategies can be found in the following guides:

How to Develop a Pedestrian Safety Action Plan (FHWA-SA-05-12)
http://drusilla.hsrc.unc.edu/cms/downloads/howtoguide2006.pdf

A Resident's Guide for Creating Safe and Walkable Communities (FHWA-SA-07-016)
http://safety.fhwa.dot.gov/PED_BIKE/ped/ped_walkguide/residentsguide.pdf