

# **US 101 (Broadway) K-Mart to 4th St**

**Pedestrian and Bicycle Road Safety Audit**

**Humboldt County, California**

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VHB**

**August 25-28, 2008**

# 1. Introduction

## 1.1. Objectives of Study

The objective of this study was to complete a pedestrian and bicycle road safety audit (RSA) for US 101 (Broadway) between K-Mart Entrance (PM 75.0) and 4<sup>th</sup> Street (PM 78.03) in the city of Eureka, Humboldt County, California (see Figure 1).

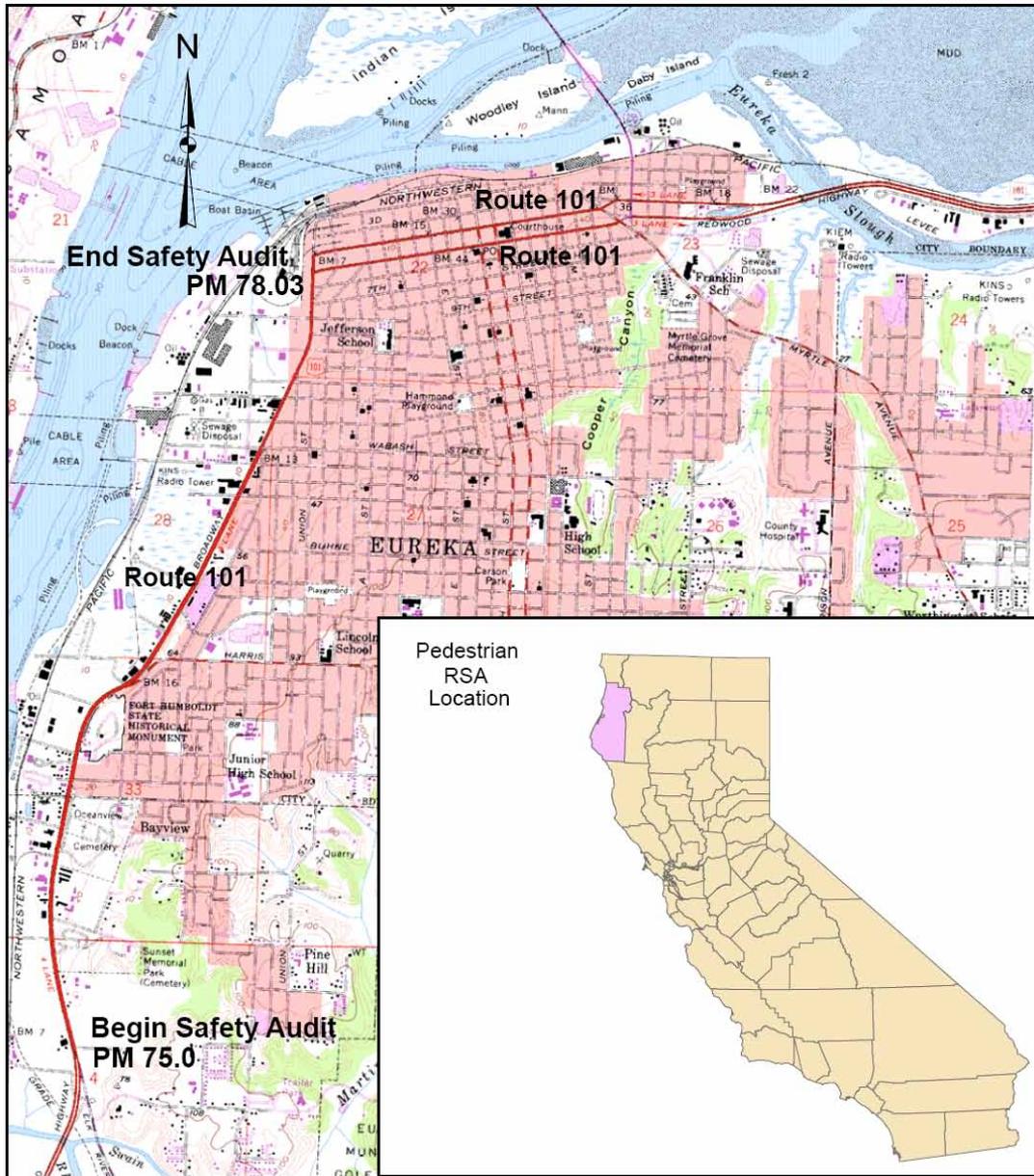


Figure 1. Study Area

## **1.2. Background**

US 101(Broadway) is a four-lane, north-south urban principal arterial highway in a mixed land use area in the City of Eureka, Humboldt County, California. The length of the section studied is approximately 3 miles. To the south of the study area Broadway is a divided freeway and to the north/northeast of the study area it changes to an independently aligned urban principal arterial couplet. This highway serves as a commuter route and also provides access to the central business district and residences on the outskirts of the City of Eureka. There is a significant amount of pedestrian and bicycle activity in this area.

Eighty-nine pedestrian and bike collisions were reported in the study area between January 1, 1997, and September 30, 2007. Caltrans has a strong safety program focused on pedestrians and bicyclists and plans to conduct a detailed corridor study in an attempt to reduce pedestrian and bicycle related collisions. The purpose of this RSA was to identify additional safety issues that may be contributing to the observed pedestrian and bicycle collisions and suggest approaches that can be taken to mitigate the issues.

The RSA team consisted of 16 members, representing the consultant, Federal Highway Administration, Caltrans, Humboldt County, City of Eureka, Redwood Community Action Agency, and Green Wheels. The RSA was performed on August 25-28, 2008, during daytime and nighttime hours.

## **2. Existing Conditions**

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### **2.1. Site Characteristics and Pedestrian and Bicycle Accommodations**

In the study area, Broadway, hereafter referred to as simply “Broadway,” is an urban principal four-lane arterial highway with a continuous two-way left-turn lane. To the south of the study area, Broadway is a divided freeway with a posted speed limit of 65 mph. The highway has a posted speed limit of 45 mph in both directions at the south end of the study area from K-Mart entrance up to Hilfiker Street. The posted speed limit between Hilfiker Street and Wabash Avenue is 40 mph in both directions and from Wabash Avenue to 4<sup>th</sup> Street it is 30 mph in both directions.

Sidewalks, of variable widths, with curb and gutter are located on both sides of the highway in the commercial areas. There are sections along Broadway that have gaps in the sidewalks. Paved shoulders with variable widths are located on both sides of the highway between the K-Mart Entrance and W. Wabash Avenue. These paved shoulders are used frequently by bicyclists. Between W. Wabash Avenue and 14<sup>th</sup> Street, shoulders are located only on the west side of Broadway. To the north of 14<sup>th</sup> Street, Broadway does not have paved shoulders.

There are 10 traffic signals along the study section of Broadway:

- at the intersections of K-Mart Entrance.
- Pierson’s Entrance.

- McCullens Avenue.
- S. Bayshore Mall Entrance.
- N. Bayshore Mall Entrance.
- W. Henderson Street.
- W. Wabash Avenue.
- W. 14<sup>th</sup> Street, W. Washington Street.
- W. 6<sup>th</sup> Street.

Marked crosswalks are located at each of these intersections; however, not all approaches have marked crosswalks.

An annotated map of the study area and table identifying the missing sidewalk sections, missing shoulder sections, and distances between the traffic signals can be found in Appendix A.

## **2.2. Traffic Data**

Based on data provided by Caltrans, the average daily traffic (ADT) of the highway in the study area ranged from 31,000 vehicles per day (vpd) at the freeway terminal point south of the study area, to 42,000 vpd at the intersection of Broadway and W. Henderson Street, to 35,000 vpd north of the study area. There is a significant volume of pedestrian and bicycle traffic in the study area. Pedestrian and bicycle count data in the study area were collected at 12 locations in July 2008 by Caltrans between 12:00pm and 3:00pm. Review of these counts indicated that an average of 187 pedestrians crossed Broadway in the study area. The top three locations for pedestrians crossing Broadway were Washington Street, W. Wabash Avenue, and McCullens Avenue. These data also identified that an average of 198 bicycles were observed using Broadway during this time period. There are two transit services in the study area: the Redwood Transit System and the Eureka Transit Service, both operated by Humboldt Transit Authority. Transit boarding appears to be one of the primary generators of pedestrian traffic in the area.

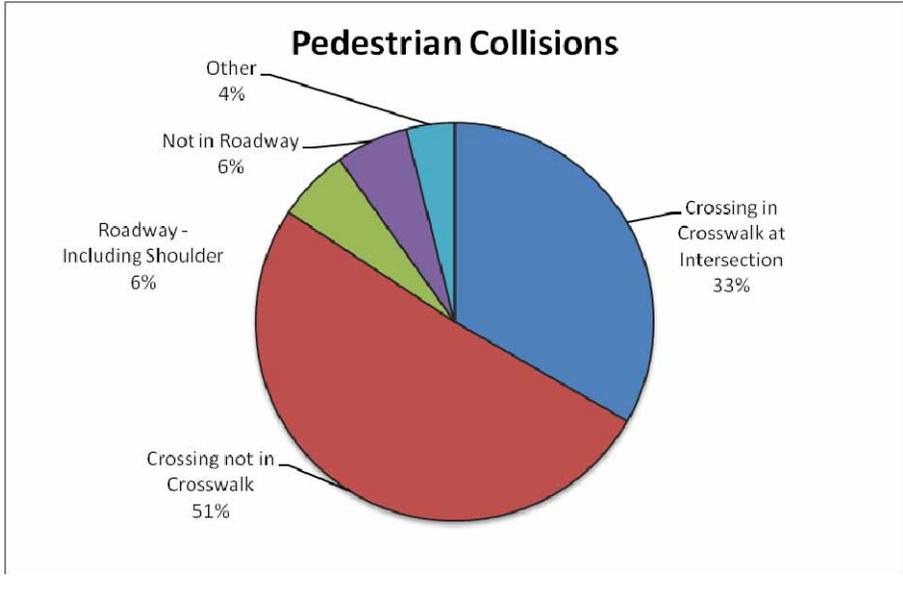
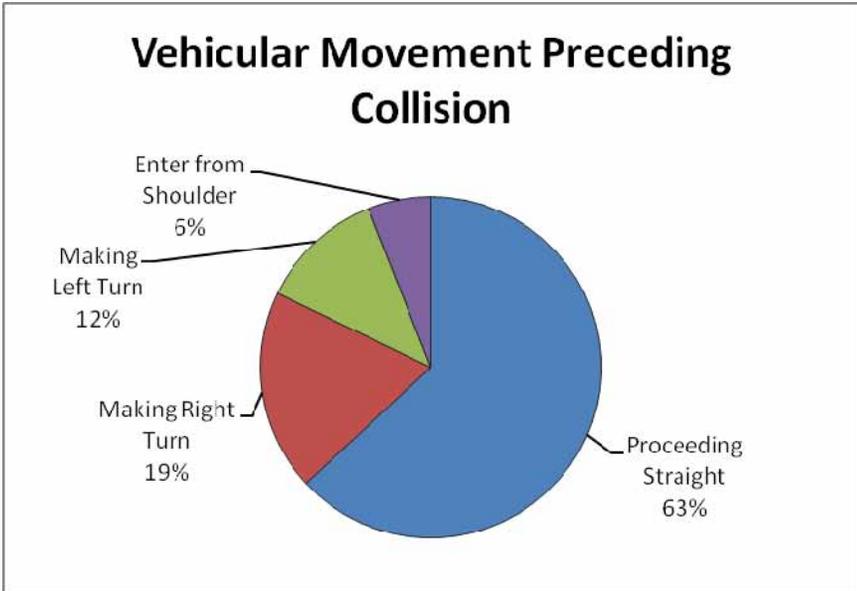
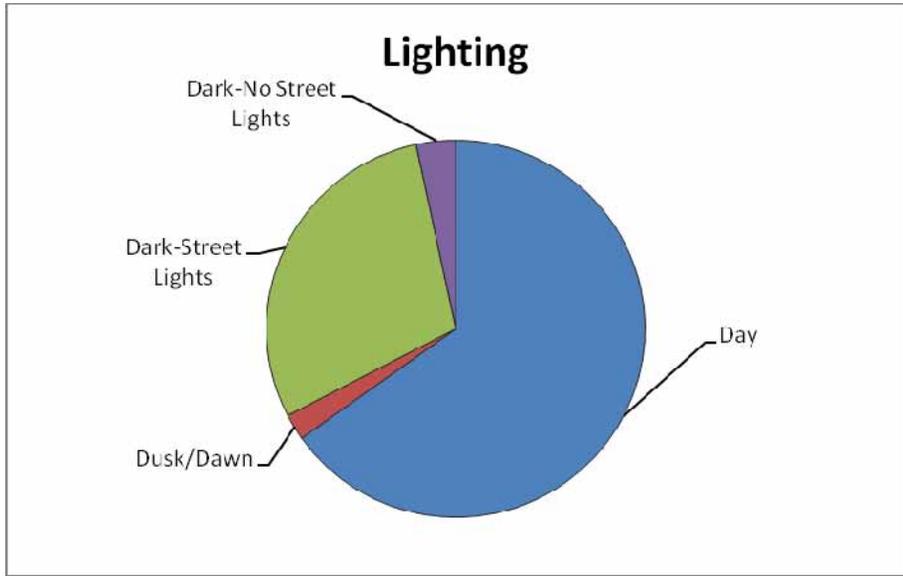
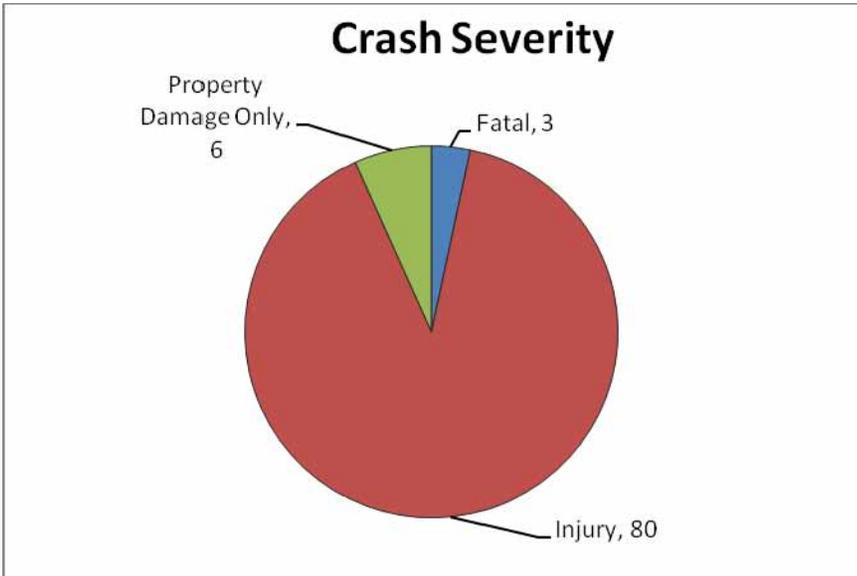
## **2.3. Collision Analysis**

Caltrans also provided pedestrian and bicycle collision summaries for Broadway between K-Mart Entrance and 5<sup>th</sup> Street from 1997 through 2007. During that period there were eighty-nine (89) reported pedestrian and bicycle collisions within the study area. Approximately 60 percent of those collisions involved pedestrians (51 collisions) and approximately 40 percent involved bicyclists (36 collisions). (Note that two collisions were coded as pedestrian/bicycle related but did not specify whether a pedestrian or bicyclist was involved.) The collision data were examined more closely to identify trends in collisions. The results are shown in Figure 2 and can be summarized as follows:

- Nearly all collisions involving pedestrians or bicyclists resulted in a fatality (3 collisions) or an injury (80 collisions).
- While most of the pedestrian and bicycle related collisions occurred during the day, over a third occurred at night, which may reflect a higher nighttime collision rate based on lower pedestrian and bicyclist activity at night.
- The most common vehicle maneuver preceding the reported pedestrian- and bicycle-related collisions was proceeding straight, implying that these collisions were related to crossing

and potential lack of expectancy on the part of the motorist of encountering a crossing pedestrian or bicyclist. The second most common vehicular maneuver preceding a collision was making a turn, which accounted for nearly 30 percent of the pedestrian- and bicycle-related collisions.

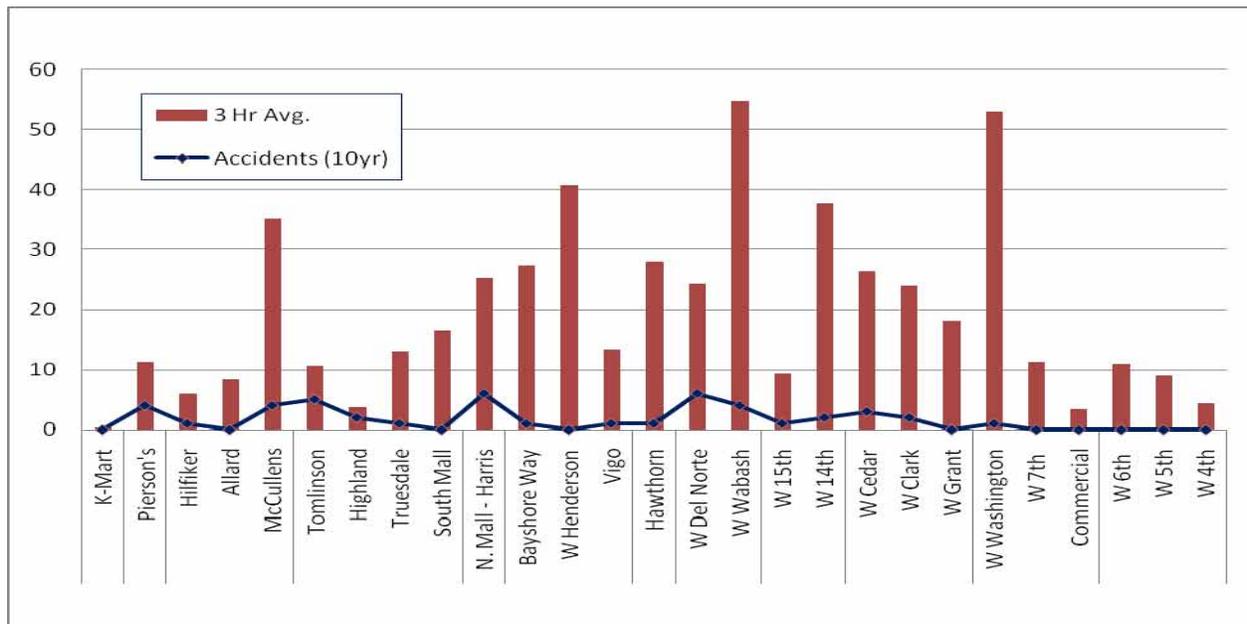
- Of the reported pedestrian collisions, over half of the collisions were not in the crosswalk and a third of the collisions were in the crosswalk. On highway shoulder and not in the highway accounted for another 12 percent of the pedestrian collisions. These data describe the vehicular movement preceding the collision and reinforces the fact that crossing-related collisions are the biggest concern, especially those not in the crosswalk.



**Figure 2. Collision Analysis of Study Area**

Figure 3 shows the average 3-hour pedestrian counts described in Section 2.2 plotted with the 10 year total of pedestrian collisions. The areas of concern based on these data can be described as follows:

- *Areas with relatively high volumes and high number of collisions:* Pedestrians are using the crossing in greater numbers but are being struck while crossing. This may be an indicator of pedestrians crossing against the signal for various reasons, turning vehicles striking pedestrians in the crosswalk, or vehicles violating traffic control at signalized intersections. Intersections that fall under this category include:
  - McCullens Avenue.
  - North Bayshore Mall Entrance.
  - West Del Norte Street.
  - Wabash Avenue.
- *Areas with relatively low number of crossings and high number of collisions:* Fewer pedestrians are crossing at these locations and are involved in collisions as frequently or nearly as frequently as at crossings with higher usage. This may be an indicator of lack of driver expectancy, pedestrians crossing against the signal for various reasons, and/or insufficient guidance provided to motorists and pedestrians. Intersections that fall under this category include:
  - Pierson’s Entrance.
  - Tomlinson Street.



**Figure 3. Average Pedestrian Counts vs. 10-Year Ped/Bike Collisions**

Areas with a relatively high number of crossings and low number of collisions are desirable. A good example is Washington Street where the 3-hour average number of pedestrians crossing is over 50 and the number of collisions is relatively low (one collision).

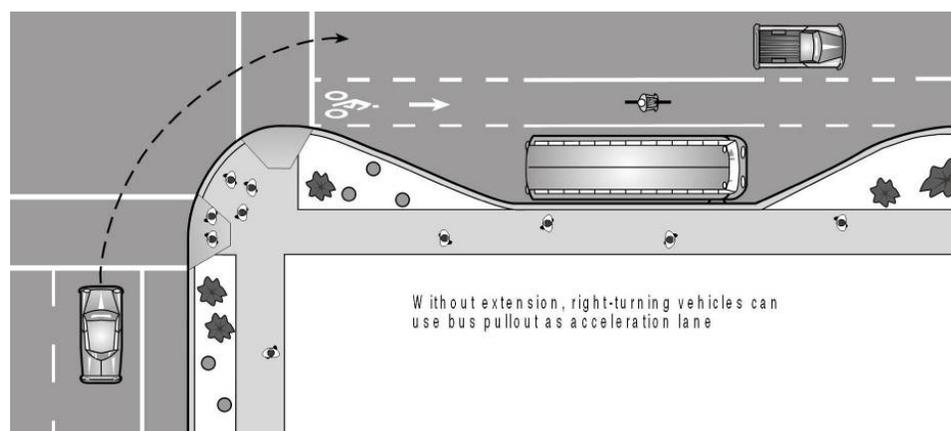
### 3. Assessment Findings

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#### 3.1. Safety Benefits of Existing Highway Features and Programs

Caltrans is taking a proactive approach to addressing pedestrian and bicycle safety issues on this busy corridor. However, several measures are already in place to improve safety for pedestrians and bicyclists. Notable existing highway features and programs initiated by Caltrans that enhance pedestrian and bicycle safety in the study area include:

- **New Bus Stop Design** – The owner/developer of the Broadway Cinema recently installed a bus bay with a shelter through the Caltrans encroachment permit process and it is located at the corner of Broadway and West Cedar Street. The bus bay design includes a bulb-out to prevent vehicles from using the bay as an acceleration lane and helps to reduce the speeds of vehicles turning right onto Broadway (see Figure 4).
- **Raised Pavement Markers** – Raised pavement markers (RPMs) help delineate the highway at night and provide guidance to drivers at night. Generally, roads with RPMs experience fewer collisions than those without RPMs.
- **Community Involvement** – Caltrans hosted a public meeting that was attended by over 20 people as part of this RSA process. The meeting was held the evening before the RSA kickoff meeting. This public forum presented an opportunity for residents to present concerns to Caltrans and the RSA team. Several attendees also filled out comment cards identifying concerns. The issues and concerns identified by the residents were investigated and discussed by the RSA team.
- **Upcoming Feasibility Study** – Caltrans will be conducting a detailed study of the corridor which will use this RSA report as part of the inputs to the study. Some of the suggestions in this report will be evaluated further to determine their feasibility.



**Figure 4. The New Bus Stop Design Concept Applied at the Corner of Broadway and West Cedar Street (Source: Oregon Bicycle and Pedestrian Plan).**

### 3.2. Identified Safety Issues and Suggestions for Improvement

Despite the many measures to improve pedestrian safety throughout the RSA corridor, nine general issues were identified. The RSA team members prioritized the issues based upon their perceived importance in the study area. A detailed discussion of each issue and suggestion is presented in Appendix B and conceptual sketches are illustrated in Appendix C.

SAFETY ISSUE	POTENTIAL CAUSE	SUGGESTIONS
<b>1. Lack of Continuity and Connectivity</b>		
Gaps in sidewalks on Broadway	<ul style="list-style-type: none"> <li>• Old design not intended for current pedestrian usage.</li> <li>• Old planning requirements were not intended for pedestrian usage.</li> </ul>	<p><i>Intermediate-</i> Consider installing sidewalks to fill gaps along Broadway (see Appendix A).</p> <p><i>Long-term-</i> Create urban cross section with sidewalks and buffers on both sides of Broadway.</p>
Lack of continuity across side streets	<ul style="list-style-type: none"> <li>• Lack of coordination with facility designs on adjacent developments.</li> <li>• Old design precedes ADA requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• Consider installing ladder style crosswalks at identified side streets.</li> <li>• Ensure traffic control devices are used that separate conflict points between motorists and pedestrians.</li> <li>• Ensure curb radii are appropriate for traffic speeds entering residential areas.</li> <li>• Ensure ramps align with crosswalks and sidewalks and follow direct paths.</li> </ul>
<b>2. Long Distances Between Crossings</b>		
Long distances between crossings on Broadway	Old design not intended for current pedestrian usage.	<p><i>Short-term to intermediate-</i> Consider installing additional crossings along Broadway. Specific locations include:</p> <ul style="list-style-type: none"> <li>• North of W. Harris St.</li> <li>• At Hawthorne St.</li> <li>• At Clark St.</li> </ul>

SAFETY ISSUE	POTENTIAL CAUSE	SUGGESTIONS
High number of midblock crossings	<ul style="list-style-type: none"> <li>• Location of pedestrian “desire lines.”</li> <li>• Long distance between signalized marked crosswalks.</li> <li>• Long waits at crossings.</li> <li>• Perceived safety of crossings.</li> </ul>	<p><i>Intermediate-</i></p> <ul style="list-style-type: none"> <li>• Consider installing median islands along Broadway, especially between Truesdale St. and McCullens Ave.</li> <li>• Relocate bus stops south of Wabash Ave.</li> <li>• Conduct a safety campaign with improvements to facilities.</li> </ul> <p><i>Long-term-</i></p> <ul style="list-style-type: none"> <li>• Create uniform urban cross section along both sides of Broadway.</li> </ul>
<b>3. Access Control</b>		
High number of access points	<ul style="list-style-type: none"> <li>• Lack of access management plan.</li> <li>• Large distance between crossings.</li> </ul>	<p>Consider consolidating access points. Specific areas that were identified include:</p> <ul style="list-style-type: none"> <li>• AT&amp;T store along northbound Broadway at McCullens Ave.</li> <li>• Motel at W Henderson St. in the northbound direction.</li> <li>• Patriot Gas Station at Wabash Ave. in the northbound direction.</li> <li>• Deals on Wheels at 14th St. in the southbound direction.</li> <li>• Access near Pierson’s.</li> </ul>
Design of access points	<ul style="list-style-type: none"> <li>• Lack of access management plan.</li> <li>• Old design not intended for current traffic volumes.</li> </ul>	<p>Consider reducing width of access points and adding traffic control at the following access points:</p> <ul style="list-style-type: none"> <li>• 76 Gas Station near Pierson’s.</li> <li>• Performance Tires near Clark St.</li> <li>• Specialty Traffic Systems near Hawthorne St.</li> <li>• The car wash near the 76 Gas Station.</li> </ul>
Lack of delineation between sidewalks and parking areas	<ul style="list-style-type: none"> <li>• Old design not intended for current pedestrian usage.</li> <li>• Old design precedes ADA requirements.</li> </ul>	<ul style="list-style-type: none"> <li>• Pave sidewalks and highway surfaces with different materials.</li> <li>• Remove or modify parking in areas where vehicles may back over pedestrian paths.</li> </ul>
Limited waiting areas at bus stops	<ul style="list-style-type: none"> <li>• Old design not intended for current pedestrian usage.</li> <li>• Old design precedes ADA requirements.</li> </ul>	<p><i>Short-term:</i> Provide delineators or barrier between parking area and bus stop near McCullens Ave.</p>

SAFETY ISSUE	POTENTIAL CAUSE	SUGGESTIONS
<b>4. Safety Issues for Bicyclists</b>		
No dedicated bicycle facilities	<ul style="list-style-type: none"> <li>• Old design not intended for current bicycle usage.</li> </ul>	<p><i>Intermediate to long-term:</i></p> <ul style="list-style-type: none"> <li>• Create continuous bicycle facilities using:               <ul style="list-style-type: none"> <li>- Marked bike lanes 5' – 6' wide (south of Wabash Ave.)</li> <li>- Alternate paths parallel to Broadway where ROW is not sufficient (north of Wabash Ave.)</li> </ul> </li> <li>• Ensure bike lanes are consistent with the detailed cross-section concept for the entire corridor.</li> <li>• Include a public awareness and safety campaign.</li> </ul>
Frequent wrong-way cyclists	<ul style="list-style-type: none"> <li>• Long distance between signalized marked crosswalks.</li> <li>• Long waits at crossings.</li> <li>• Inadequate facilities.</li> </ul>	<ul style="list-style-type: none"> <li>• Consider creating more frequent crossings and dedicated bicycle facilities.</li> <li>• Consider the following to promote proper use of facilities (<i>short-term to long-term</i>):               <ul style="list-style-type: none"> <li>- Way finding signing.</li> <li>- Education of safe riding practices.</li> <li>- Mapping of designated lanes and routes.</li> </ul> </li> </ul>
Conflicts at acceleration lanes	<ul style="list-style-type: none"> <li>• Old design not intended for current bicycle usage.</li> </ul>	<p><i>Intermediate:</i> Consider eliminating acceleration lanes and creating bicycle lanes where possible.</p>
<b>5. Conflicts at Pedestrian Crossings</b>		
High-speed turns at channelized right-turn lanes	<ul style="list-style-type: none"> <li>• Old design not intended for current pedestrian usage.</li> </ul>	<p><i>Short-term / intermediate:</i></p> <ul style="list-style-type: none"> <li>• Consider modifying right-turn channel.</li> <li>• Relocate crosswalk to improve visibility of pedestrians.</li> </ul> <p><i>Intermediate:</i></p> <ul style="list-style-type: none"> <li>• Use pedestrian countdown signals.</li> <li>• Use continental crosswalk pavement markings.</li> </ul>

SAFETY ISSUE	POTENTIAL CAUSE	SUGGESTIONS
Blocked sight triangles	<ul style="list-style-type: none"> <li>Old design not intended for current pedestrian usage.</li> </ul>	<p><i>Short-term:</i> Place signs next to signal head to yield to pedestrians.</p> <p><i>Short-term/intermediate:</i></p> <ul style="list-style-type: none"> <li>Consider curb extensions to improve sight lines.</li> <li>Consider redesigning problem locations with smaller right-turn radii and improved sight distance for pedestrians.</li> </ul>
<b>6. Conflicts in Two-Way Left-Turn Lane (TWLTL)</b>		
Conflicts in TWLTL	<ul style="list-style-type: none"> <li>Location of pedestrian and bicyclist “desire lines.”</li> <li>Long distance between signalized marked crosswalks.</li> <li>Old design not intended for current pedestrian usage.</li> </ul>	<p>Consider modifying TWLTL to provide proper median refuge for pedestrians and bicyclists. Locations for median placement include but are not limited to:</p> <ul style="list-style-type: none"> <li>North of Harris St.</li> <li>South of Truesdale St.</li> </ul>
<b>7. Accessibility Restrictions</b>		
Crossings with limited accessibility	<ul style="list-style-type: none"> <li>Old design precedes ADA requirements.</li> </ul>	<p><i>Short-term:</i></p> <ul style="list-style-type: none"> <li>Realign crosswalks that are not straight (see Appendix D).</li> <li>Conduct formal evaluation of ADA compliance.</li> </ul>
Uneven walking surfaces	<ul style="list-style-type: none"> <li>Old design precedes ADA requirements.</li> </ul>	<p><i>Short-term:</i> Identify and repair unsmooth surfaces on all pedestrian facilities.</p>
<b>8. Maintenance and Drainage</b>		
Blocked sight triangles	<ul style="list-style-type: none"> <li>Overgrown vegetation and lack of maintenance.</li> </ul>	<p><i>Short-term:</i> Trim foliage to improve sight distances.</p>
Reduced sidewalk width	<ul style="list-style-type: none"> <li>Overgrown vegetation and lack of maintenance.</li> </ul>	<p><i>Short-term:</i> Trim vegetation to improve the effective sidewalk width.</p>
Level areas between sidewalk and street	<ul style="list-style-type: none"> <li>Old design that did not establish proper drainage.</li> </ul>	<p><i>Short-term/intermediate:</i> Provide positive drainage and separation between vehicular and pedestrian traffic.</p>
<b>9. Signage</b>		
Nighttime visibility	<ul style="list-style-type: none"> <li>Old signs have lost retro-reflectivity.</li> </ul>	<p><i>Short-term:</i> Consider upgrading signs with retro-reflective sheeting and relocating signs to mast arms.</p>

## 4. Conclusions

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Nine safety issues have been identified in this in-service RSA. Based on a review of collision data and field observations, continuity and connectivity of pedestrian and bicycle facilities were determined to be the most critical issues for the study areas and the long distances between crossings was a close second. The remaining seven safety issues are ranked below these most critical issues from most to least critical, although many were considered nearly equal in importance. In general, developing a cross-section to better serve the needs of pedestrians and bicyclists is recommended for the study corridor. Suggestions for mitigating issues have been identified and are described in this report and have been categorized by short-term, intermediate, and long-term based on the resources needed to implement the suggestion.

Beyond engineering measures, road safety can be improved through education and enforcement. These measures are also discussed in the report.

The owners are invited to consider the suggested changes. To complete the RSA process, the owners may prepare a short written response to the issues and options outlined in this report.

## 5. References

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