PBIC Webinar

Bicycle Safety Guide and Countermeasure Selection System (BIKESAFE) Webinar

Tamara Redmon, FHWA Office of Safety
Carl Sundstrom, UNC Highway Safety Research Center
Dan Nabors, Vanasse Hangen Brustlin, Inc.
Peter Lagerwey, Toole Design Group

Feb. 19, 2015, 2 pm

Today's Presentation

- Introduction and housekeeping
- Presentations
- Questions at the end

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⇨**Certificate of Attendance**

You will receive a certificate of attendance by email from the UNC Highway Safety Research Center

Pedestrian and Bicycle Information Center

Dear James,

Thank you for registering for "A Resident's Guide for Creating Safer Communities for Walking and Biking".

The Federal Highway Administration just released "A Resident's Guide for Creating Safer Communities for Walking and Bicycling," a free guide offering step-by-step instructions for residents and community groups looking to improve pedestrian and bicyclist safety, access, and comfort. This webinar offers an overview of the guide and will review how two communities used the principles outlined within it to make their communities more walkable and bikeable.

Tamara Redmon, with FHWA's Office of Safety, will introduce the guide and discuss how it fits within the US Department of Transportation's Safer People, Safer Streets Initiative.

Laura Sandt, with the Pedestrian and Bicycle Information Center, will discuss the content of the new guide and how residents can use it.

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Pedestrian and Bike Safety are priorities for the US Department of Transportation:

- Secretary's New Initiative on Ped/Bike Safety:
  - http://www.dot.gov/briefing-room/us-transportation-secretary-foxx-announces-new-initiative-enhance-pedestrian-and
  - Mayor's Challenge for Safer People, Safer Streets:

    http://www.dot.gov/mayors-challenge
- Road Diet Informational Guide: http://safety.fhwa.dot.gov/road_diets/info_guide/.
- Resident's Guide for Creating Safer Communities for Walking and Biking: http://safety.fhwa.dot.gov/ped_bike/ped_cmnity/ped_walkguide/residents_guide2014_final.pdf

U.S. Department of Transportation
Federal Highway Administration

Pedestrian and Bicycle Information Center

New BIKESAFE Guide Now Available

www.pedbikesafe.org/BIKESAFE/

BIKESAFE

Purpose

- To assist transportation professionals in making effective use of countermeasures that affect bicycle safety and mobility.
- Provides a wide range of resources on bicycle-related engineering and roadway treatments

Background

- BIKESAFE 2014 is primarily a web-based resource
- BIKESAFE includes:
  - details on 46 engineering treatments
  - updates on safety research (CMF's)
  - crash/countermeasure matrix
  - links to other resources
  - updated countermeasure costs
  - A total of 34 new and updated case studies
  - updated expert system tool

Features of BIKESAFE 2014

- Latest guidelines
- Best engineering practices
- Most recent safety research (CMF's)
- Updates of countermeasure costs (from 40 states)
- New and updated case studies
- Many new links to other web resources
- Expanded and enhanced expert system tool
- Web resource compatible with smart phones

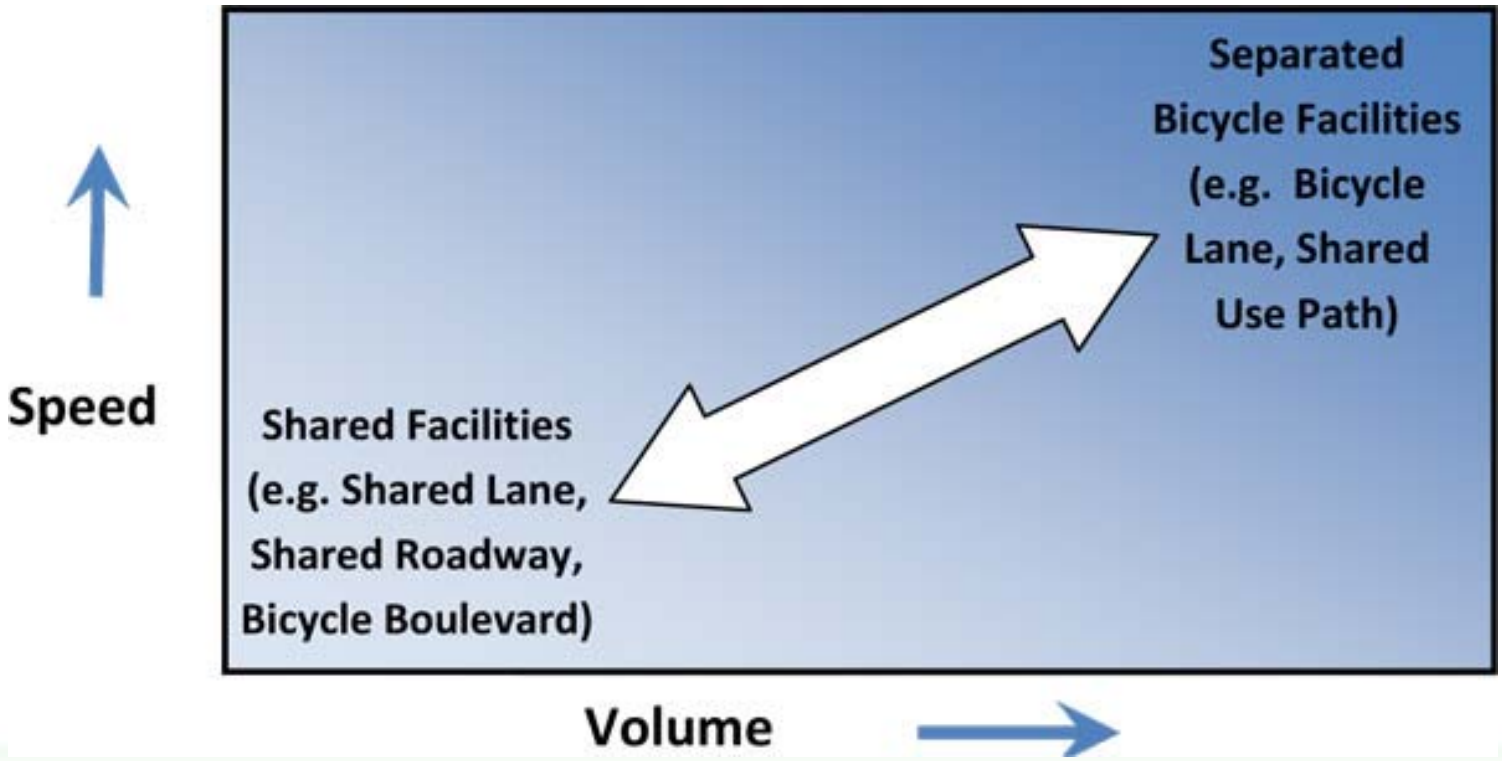
Background

Roads and streets should be designed to be reasonable safe for all types of road users, including pedestrians and bicyclists

How Land Use Affects Bicyclists

http://www.pedbikeimages.org/ - Dan Burden

How Bicyclists are Affected by Traffic: Vehicle Volume and Speed



Bicycle Road Safety Audit Guidelines and Prompt Lists (2012),
Federal Highway Administration

Complete Streets

http://www.pedbikeimages.org/ - Jennifer Campos

Selecting Improvements for Bicyclists

⇨ The process for addressing bicycle safety includes:

- Engage stakeholders/ public outreach
- Identifying factors affecting bicycle safety
- Analyzing crash data
- Analyzing roadway design and operation characteristics that affect bicycle safety
- Establishing crash related and/or performance-based goals
- Selecting and implementing countermeasures that address bicycle safety
- Evaluating the effectiveness of measures implemented

Identification of Potential Locations for Countermeasures

⇨ Crash data

- Provide information where, when, crash characteristics, people involved
- Useful to identify and summarize:
  - Locations
  - Crash factors
  - Bicyclists most at risk
  - Trends

http://www.pedbikeimages.org/ - Laura Sandt

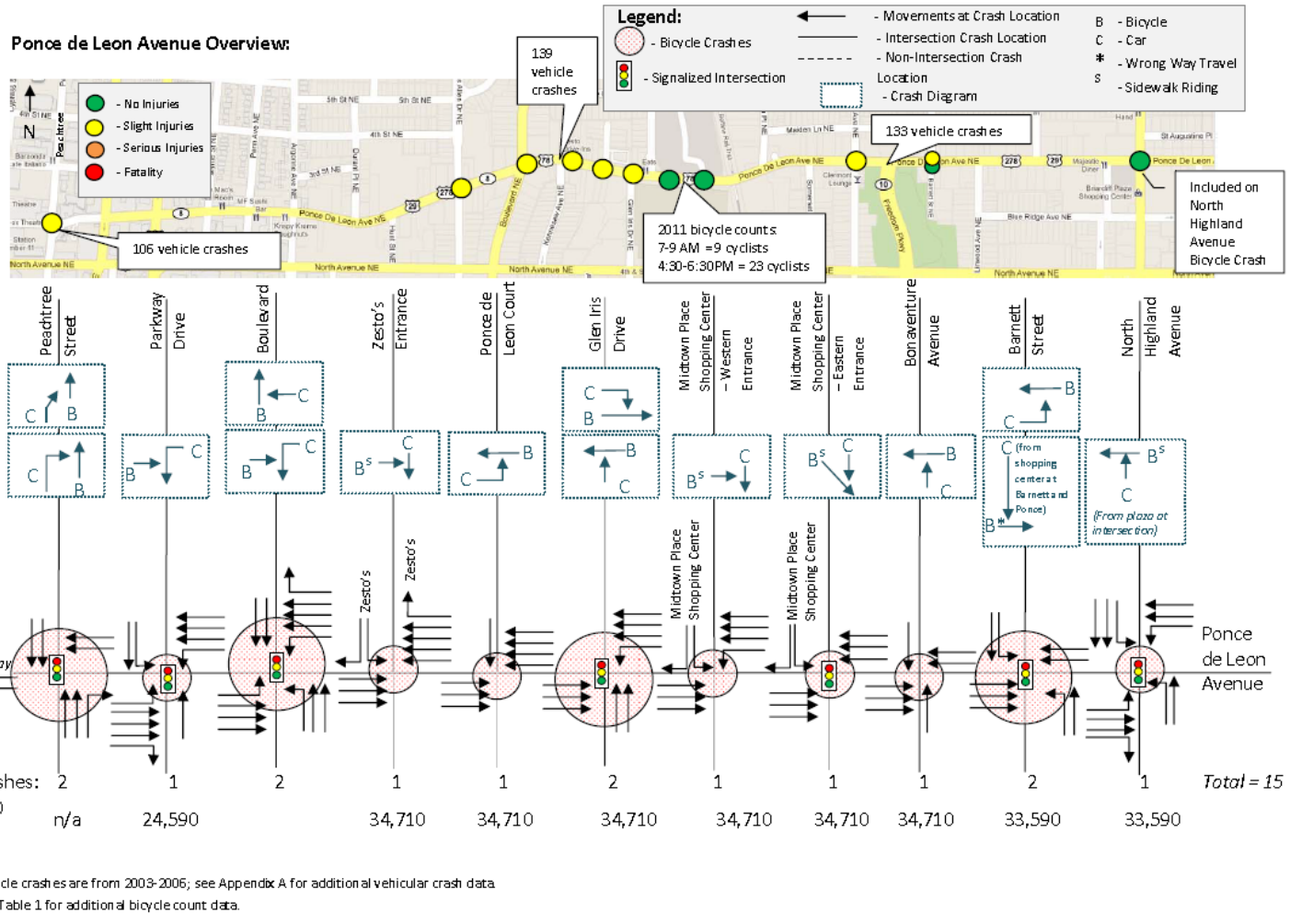
Annotating Crash Data

Severity/
Land Use

Crash Type

Geometry

Traffic



Notes:

a. Vehicle crashes are from 2003-2006; see Appendix A for additional vehicular crash data.

b. See Table 1 for additional bicycle count data.

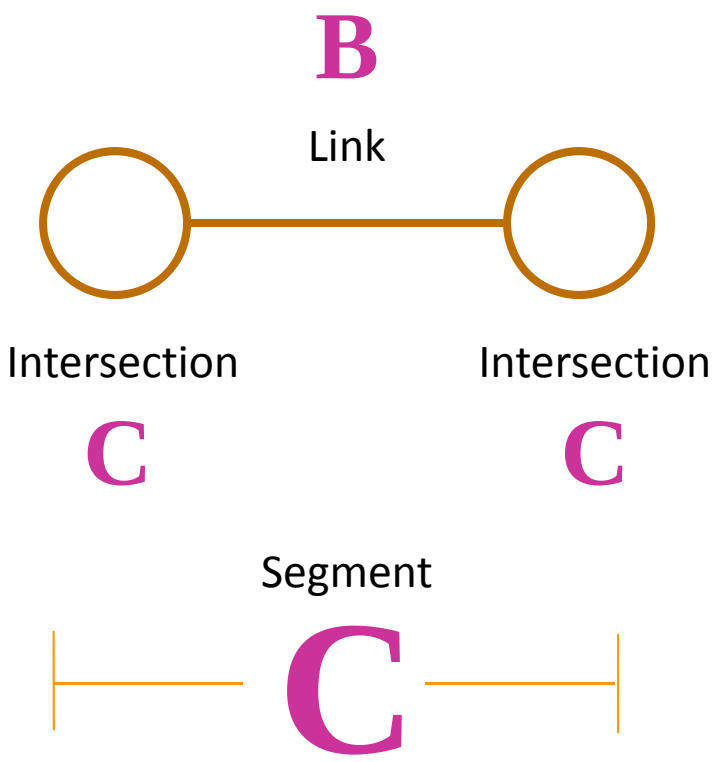
Identification of Potential Locations for Countermeasures

- Location Analysis Tools
  - **Audits/Assessments**
  - Level of service analysis
  - Intersection analysis
  - GIS

Bicycle Road Safety Audit Guidelines and Prompt Lists (2012), Federal Highway Administration

Identification of Potential Locations for Countermeasures

- Location Analysis Tools
  - Audits/Assessments
  - **Level of service analysis**
  - Intersection analysis
  - GIS



Bicycle Road Safety Audit Guidelines and Prompt Lists (2012), Federal Highway Administration

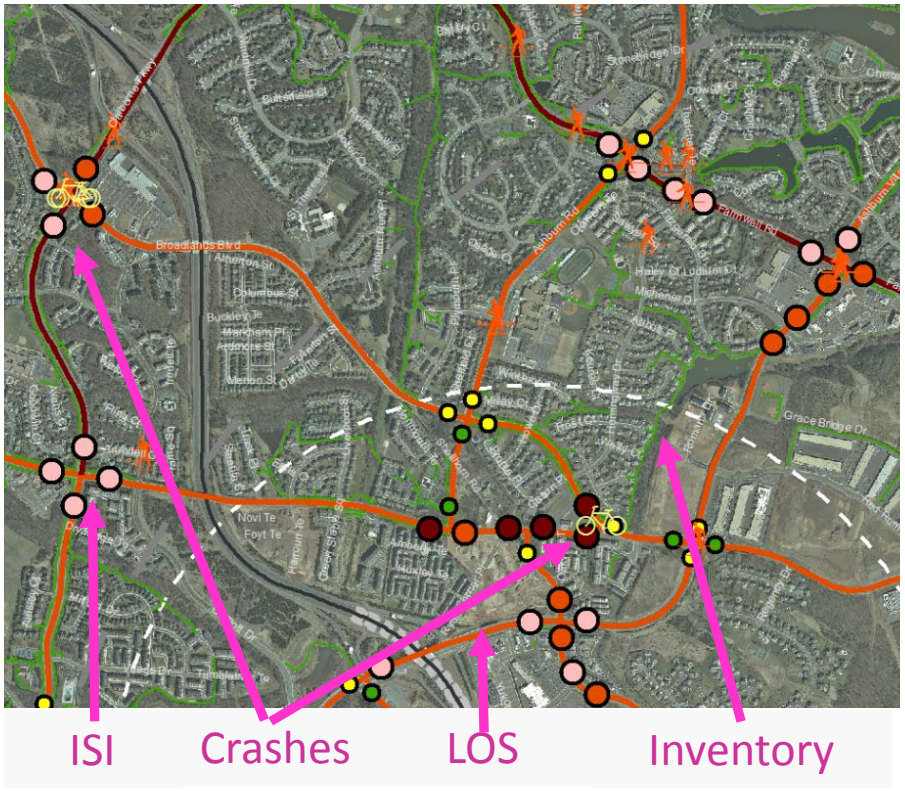
Identification of Potential Locations for Countermeasures

- Location Analysis Tools
  - Audits/Assessments
  - Level of service analysis
  - **Intersection analysis**
  - GIS

Bicycle Road Safety Audit Guidelines and Prompt Lists (2012), Federal Highway Administration

Identification of Potential Locations for Countermeasures

- Location Analysis Tools
  - Audits/Assessments
  - Level of service analysis
  - Intersection analysis
  - **GIS**



Bicycle Road Safety Audit Guidelines and Prompt Lists (2012), Federal Highway Administration

Selecting Crash-Related Countermeasures

Crash Type Matrix

View the Performance Objective Matrix here.

Crash Type	Shared Roadway	On-Road Bike Facilities	Intersection Treatments	Maintenance	Traffic Calming	Trails/ Shared-Use Paths	Markings, Signs & Signals	Other Measures
Motorist failed to yield - signalized intersection	X		X		X	X	X	X
Motorist failed to yield - non-signalized intersection	X		X		X	X	X	X
Bicyclist failed to yield - signalized intersection	X		X		X	X	X	X

Selecting Crash-Related Countermeasures

Crash Type	Shared Roadway	On-Road Bike Facilities	Intersection Treatments	Maintenance	Traffic Calming	Trails/ Shared-Use Paths	Markings, Signs & Signals	Other Measures
Motorist failed to yield - signalized intersection	X		X		X	X	X	X
Motorist failed to yield - non-signalized intersection	X		X		X	X	X	X
Bicyclist failed to yield - signalized intersection	X		X		X	X	X	X
Bicyclist failed to yield - non-signalized intersection	X		X		X	X	X	X
Motorist drove out - midblock	X					X	X	X
Bicyclist rode out - midblock	X	X			X	X	X	X
Motorist turned or merged left into path of bicyclist	X	X	X		X	X	X	X
Motorist turned or merged right into path of bicyclist	X	X	X		X	X	X	X
Bicyclist turned or merged left into path of motorist	X	X	X	X	X	X	X	X
Bicyclist turned or merged right into path of motorist	X	X	X	X	X	X	X	X
Motorist overtaking bicyclist	X	X		X	X	X	X	X
Bicyclist overtaking motorist	X	X		X		X	X	X
Non-motor vehicle crashes	X			X		X	X	X

Performance Objective-Related Countermeasures

Performance Objective Matrix

View the Crash Type Matrix here.

Objective Type	Shared Roadway	On-Road Bike Facilities	Intersection Treatments	Maint-enance	Traffic Calming	Trails/ Shared Paths	Markings, Signs & Signals	Other Measures
Provide safe on-street facilities/space for bicyclists	X	X		X	X		X	X
Provide off-road paths or trails for bicyclists				X		X	X	X
Provide and maintain quality surfaces for	X			X			X	

Objective Type	Shared Roadway	On-Road Bike Facilities	Intersection Treatments	Maint-enance	Traffic Calming	Trails/ Shared Paths	Markings, Signs & Signals	Other Measures
Provide safe on-street facilities/space for bicyclists	X	X		X	X		X	X
Provide off-road paths or trails for bicyclists				X		X	X	X
Provide and maintain quality surfaces for bicyclists	X			X			X	
Provide safe intersections for bicyclists	X		X		X	X	X	
Improve motorist behavior/ compliance with traffic laws	X		X	X	X		X	X
Improve bicyclist behavior/ compliance with traffic laws	X	X	X	X	X	X	X	X
Encourage and promote bicycling	X	X		X		X	X	X

Countermeasures Overview

- 46 engineering, education, and enforcement countermeasures
  - 8 sections
  - List is not comprehensive -- new countermeasures continue to be developed
- Cost estimates provided (can vary)
- Research summary provided in companion report

Countermeasures: Shared Roadway

- Roadway Surface Improvements
- Bridge and Overpass Access
- Tunnel and Underpass Access
- Lighting Improvements
- Parking Treatments
- Median/Crossing Island
- Driveway Improvements
- Lane Reductions (road diet)
- Lane Narrowing
- Streetcar Track Treatments

http://www.pedbikeimages.org/ - Dan Burden

Parking Treatments

DESCRIPTION

Parking removed or redesigned to reduce rick to bicyclists

PURPOSE

Reduce conflicts between bicyclists and parking-related incidents

COST

Variable (restriping – curb extensions)

CONSIDERATIONS

- Need to balance community's needs
- Communicate changes
- May increase speeds
- Could create space for bike facilities

Driveway Improvements

DESCRIPTION

Every driveway and street connection is a potential conflict point

PURPOSE

Reduce conflicts between bicyclists and turning motorists, reduce turning speeds

COST

No additional costs when incorporated into original plan and construction

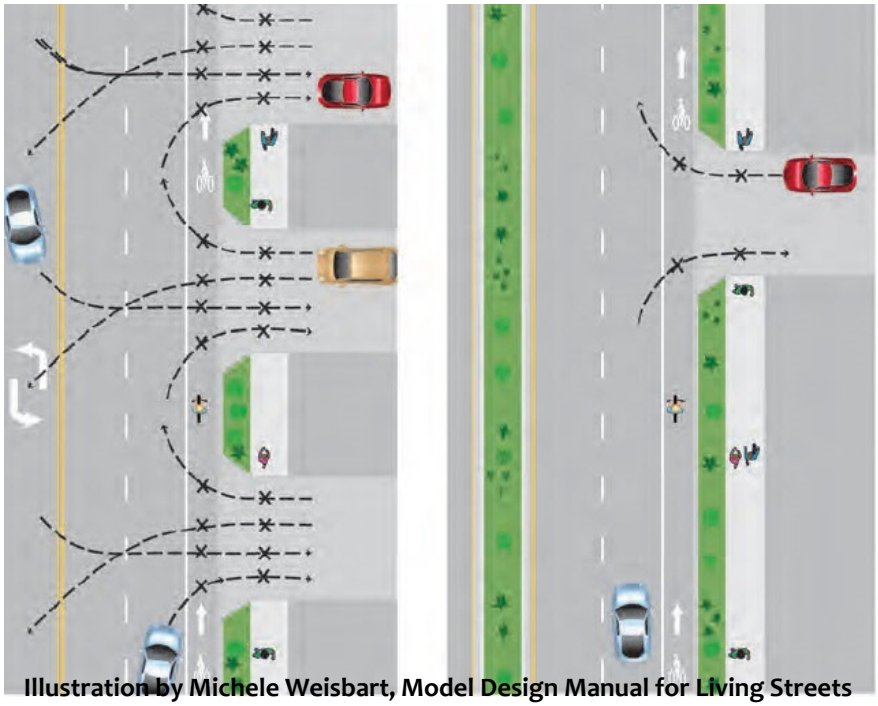


Illustration by Michele Weisbart, Model Design Manual for Living Streets

CONSIDERATIONS

- Consider street function
- Ensure good driveway design for pedestrians
- Could increase speeds

Countermeasures: On-Road Facilities

- Bike Lanes
- Wide Curb Lanes
- Paved Shoulders
- Shared Bus-Bike Lanes
- Contraflow Bike Lanes
- Separated Bike Lanes

Seattle Department of Transportation

Toole Design Group

Separated Bike Lanes

DESCRIPTION

AKA cycle tracks - bicycle facilities that run alongside a roadway separated from automobile traffic by a physical barrier

PURPOSE

Provide attractive facility for a range of riding abilities

COST

Variable (temporary striping/posts – curbs & landscaping)

http://www.pedbikeimages.org/ - Carl Sundstrom

CONSIDERATIONS

- Visibility at intersections and driveways are key
- Consider minimum width maintenance equipment
- Bike signal heads may be appropriate

Countermeasures: Maintenance

- Repetitive/Short-term Maintenance
- Major Maintenance
- Hazard Identification Program

http://www.pedbikeimages.org/ - Dan Burden

Toole Design Group

Countermeasures: Traffic Calming

- Mini-circles
- Chicanes
- Speed Tables/ Humps/ Cushions
- Traffic Diversion
- Visual Narrowing

Countermeasures: Intersection Treatments

- Curb Radius Reduction
- Roundabouts
- Intersection Markings
- Sight Distance Improvements
- Turning Restrictions
- Merge and Weave Area Redesign


http://www.pedbikeimages.org/ - Carl Sundstrom


http://www.pedbikeimages.org/ -Libby Thomas

Curb Radius Reduction

DESCRIPTION

Reducing the curb radius at an intersection reduces the intersection footprint

PURPOSE

Smaller radii can improve safety by requiring motorists to reduce vehicle speed

COST

Vary from approximately $5,000 to $40,000


Photo by Michael Hintze

CONSIDERATIONS

- Consider the appropriate design vehicle when designing the radius
- Emergency vehicle access should be considered
- Parking and/or bike lanes increase the effective radius

Intersection Markings

DESCRIPTION

Pavement markings can remind motorists of the presence of bicyclists at intersections and help both navigate these conflict areas.

PURPOSE

Create space and awareness for bicyclists and bicycle movements at intersections

COST

Variable (paint and other markings)

CONSIDERATIONS

- Ensure clear messaging for merging/weaving
- Provide adequate space for bicyclists
- Provide appropriate signs
- Should accommodate bicyclists

Countermeasures: Trails and Shared-Use Paths

- Separate Shared-Use Paths
- Path Intersection Treatments
- Share the Path Treatments

http://www.pedbikeimages.org/ - Dan Burden

Countermeasures: Markings, Signs, Signals

- Optimizing Signal Timing for Bicyclists
- Bike-activated Signal Detection
- Sign Improvements for Bicyclists
- Pavement Marking Improvements
- School-zone Improvements
- Rectangular Rapid Flashing Beacons (RRFB)
- Pedestrian Hybrid Beacon
- Bicycle Signal Heads

Photo by Bryan Goebel

Bike-activated Signal Detection

DESCRIPTION

Signalized intersections should include detection for bicyclists to facilitate safe, comfortable, and convenient crossings at intersections for bicyclists while also minimizing delay

PURPOSE

Design signalized intersections so that all road users can safely cross

COST

Variable (bicycle detectors $1,920 on average per intersection approach)

CONSIDERATIONS

- Detectors should be adjusted to properly detect bicycles
- Detectors should be placed in the expected path of the bicyclists
- If a pushbutton is used, the location of the device should not require bicyclists to dismount or be rerouted

Bicycle Signal Heads

DESCRIPTION

Under certain conditions (such as contraflow bike lanes, separated bike lanes, or bicycle-specific phasing) bicycle signal heads can provide addition guidance.

Photo: Oregon Department of Transportation

PURPOSE

Improve safety and operations where bicycles require specific guidance

COST

Can cost as little as $1,000 per signal face

CONSIDERATIONS

- Should be clearly visible to approaching bicyclists
- Install with actuation and appropriate detection for bicyclists
- Consider variations between vehicular and bicycle-specific signal heads

Countermeasures: Other Measures

- Law Enforcement
- Bicyclist/ Motorist Education
- Transit Access
- Landscaping/ Aesthetics
- Wayfinding

http://www.pedbikeimages.org/ - Dan Burden


http://www.pedbikeimages.org/ - Sound Transit

BIKESAFE

Bicycle Safety Guide and Countermeasure Selection System

Guide: Background | Statistics | Analysis | Implementation | **Countermeasures:** List | Tool | Matrices | **Case Studies** | **Resources**

The **Bicycle Safety Guide and Countermeasure Selection System** is intended to provide practitioners with the latest information available for improving the safety and mobility of those who bike. The online tools provide the user with a list of possible engineering, education, or enforcement treatments to improve bicycle safety and/or mobility based on user input about a specific location.

GUIDE

Background
Understand what is needed to create a viable bicycle network.

Statistics
Learn about the factors related to the bicycle crash problem.

Analysis
How crash typing can lead to the most appropriate countermeasures.

Implementation
Needed components for treatments.

COUNTERMEASURES

Selection Tool
Find countermeasures based on desired objectives.

Countermeasure List
A comprehensive list of all countermeasures.

Selection Matrices
Find countermeasures based on crash types and performance objectives.

Authors and Acknowledgements

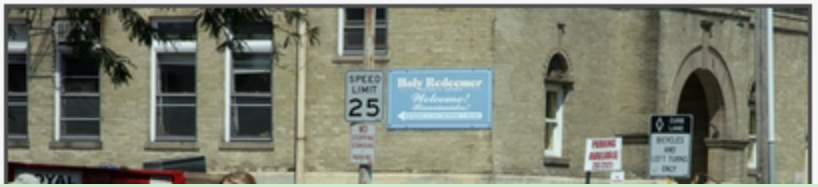
U.S. Department of Transportation
Federal Highway Administration

Background and Trends

Bicycling is an integral part of our country's transportation system. Yet, with the increasing popularity of bicycling over the past several decades, the risks to bicyclists are still evident. Engineers and planners increasingly recognize the needs of bicyclists of varying abilities. This has led to an increasing focus on the development of bicycle guidelines, particularly with the aim of improving bicycle safety. The NACTO Urban Bikeway Design Guide and the AASHTO *Guide for the Development of Bicycle Facilities* (2012) are examples of such efforts. The Bicycle Safety Guide and Countermeasure Selection System (BIKESAFE) is another resource that can help transportation professionals improve conditions for bicyclists.

http://www.pedbikeimages.org/ - Elvert Barnes

As the built environment evolves to better support multiple transportation modes, consideration should be given to how bicyclists can be accommodated. Creating a safer bicycling



Countermeasure Selection Tool

The selection tool is designed to receive input on several variables from the user in three steps.

1. Enter the Name of the Location

First, enter the location of the site in question. This allows the user to create reports for several different sites and keep the results separated by location. It is used for reporting purposes only and is not stored permanently by the operators of this website.

2. Select the Goal of the Treatment

Second, one must decide on the goal of the treatment. It may either be to acheive a specific performance objective, such as reduce traffic volumes, or to mitigate a specific type of bicycle-motor vehicle collision.

3. Describe the Site

Once a specific goal has been selected, the third step is to provide answers to a series of questions related to the geometric and operational characteristics of the site in question. The answers to these questions are used to narrow the list of appropriate countermeasures for a specific goal. For example, if the location of interest were a segment of roadway, or midblock location, then the treatments associated with intersection improvements would not be applicable and thus, would not be included in the results as possible countermeasures.

For any question where the information is not known, an entry of "unknown" will simply retain the countermeasures relevant to the question, and the range of treatments will not be reduced.

Proceed to Step 1

Countermeasure Selection Tool

Name of location: Main St & First Ave

Your Crash Type: Provide safe on-street facilities/ space for bicyclists.

Site Description Answers:

Roadway or Path: Roadway

Location: Urban - Other

Functional Class: Principal Arterial

Intersection or Midblock: Midblock

Volume: Medium (10 - 25,000 ADT)

Speed: Med (31 - 44 mph)

Lanes: 3 or 4

Signal: Not present (installation is not an option)

Bike Facilities: None or Other

Based upon your input, the following countermeasures were found:

Shared Roadway

Roadway Surface Improvements
Bridge and Overpass Access
Tunnel and Underpass Access
Lighting Improvements
Parking Treatments
Median/Crossing Island
Driveway Improvements
Reduce Lane Number
Reduce Lane Width

On-Road Bike Facilities

Bike Lanes
Wide Curb Lanes
Paved Shoulders
Combination Lanes
Contraflow Bike Lanes

Maintenance

Objective Type	Shared Roadway	On-Road Bike Facilities	Intersection Treatments	Maint-enance	Traffic Calming	Trails/ Shared Paths	Markings, Signs & Signals	Other Measures
Provide safe on-street facilities/space for bicyclists	X	X		X	X		X	X
Provide off-road paths or trails for bicyclists				X		X	X	X
Provide and maintain quality surfaces for bicyclists	X			X			X	
Provide safe intersections for bicyclists	X		X		X	X	X	
Improve motorist behavior/ compliance with traffic laws	X		X	X	X		X	X
Improve bicyclist behavior/ compliance with traffic laws	X	X	X	X	X	X	X	X
Encourage and promote bicycling	X	X		X		X	X	X

Countermeasures

A total of 46 engineering, education, and enforcement countermeasures are discussed in this chapter. The treatments and programs selected for inclusion are those that have been in place for an extended period of time and/or have proven effective. New countermeasures continue to be developed, implemented, and evaluated. Thus, practitioners should not necessarily limit their choices to those included here; this material is a starting point.

The cost estimates provided for each countermeasure are only preliminary estimates. While the costs provided here include furnishing and installation, costs can vary widely based on numerous factors, including: road conditions, quantity, materials, size and location of state and/or municipality, time of year, design costs, and inflation. Costs were compiled by reviewing bid sheets from 40 states for the years 2010-2012, and from targeted searches for the price of specific countermeasures. A countermeasure cost database for bicycle (and pedestrian) treatments can be found at www.pedbikeinfo.org/costpaper.

The effectiveness of each of the following countermeasures on bicycle crashes and safety has been documented in a separate report, entitled "Evaluation of Bicycle-Related Roadway Measures: A Summary of Available Research."

Shared Roadway

Countermeasures include:

- Roadway Surface Improvements
- Bridge and Overpass Access
- Tunnel and Underpass Access
- Lighting Improvements
- Parking Treatments
- Median/Crossing Island
- Driveway Improvements
- Lane Reductions (road diet)
- Lane Narrowing
- Streetcar Track Treatments

On-Road Bike Facilities

Countermeasures include:

< Return to Case Study Search

Back-in Diagonal Parking with Bike Lanes

Vancouver, Washington

Prepared by Todd Boulanger, with contributions from Ali Goudarz Eghtedari and John Manix

Background

McLoughlin Boulevard, a minor arterial in Vancouver, Washington, was no longer serving the surrounding land uses and users well. Along segments, the arterial was wider than its traffic volume necessitated, especially in the area of Clark College. The segments under study had one to two wide lanes in either direction and often no parking or parking limited to parallel stalls (see Image 1). The presence of on-street parking can positively or negatively affect the safety of bicyclists along the roadway. To provide new parking spaces while maintaining safety for bicyclists, Vancouver considered back-in diagonal parking. This design offers clear sightlines when pulling out and removes the risk that is present with parallel parking (a motorist opening the car door into the path of a bicyclist).

Diagonal parking in the city up to the point of this demonstration project was laid out conventionally to allow drivers to enter 45-degree stalls head-in along some of the wider arterials. Complaints about conventional diagonal parking focused on the restricted line of sight parkers had when leaving a stall and the insecurity of bicyclists in cycling along zones with conventional diagonal parking. Research conducted by the city in the 1970s documented the risk of vehicle-to-vehicle collisions when using head-in diagonal parking on an arterial street; to mitigate this concern, city engineers separated diagonal parking lanes from travel lanes with a 12-ft buffer lane for vehicle queuing (see Image 2).

Image 1: Four lane configuration before back-in parking.

The McLoughlin Boulevard corridor also lacked bike lanes, causing some bicyclists to ride on the sidewalk rather than on the street (Image 3). However, adding bicycle lanes to the head-in diagonal parking facilities with buffer zone presented a safety challenge.

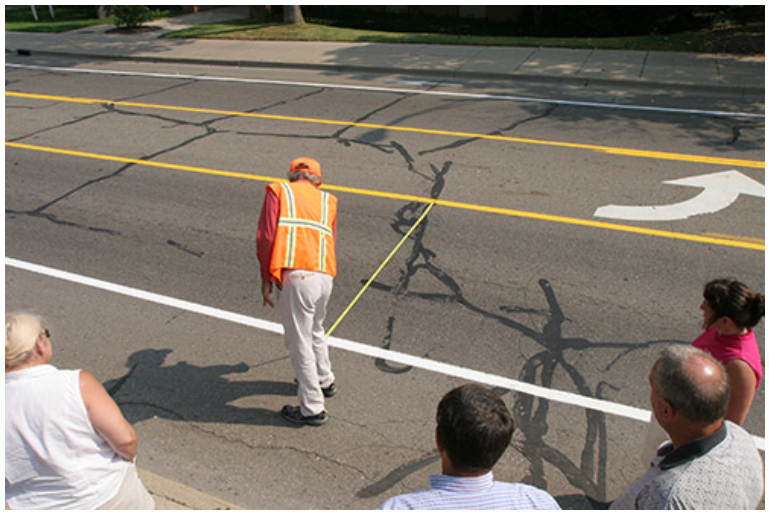
In the proposed treatment section, McLoughlin Boulevard:

- is a minor arterial,
- had two striped lanes in each direction and no parking,
- was identified as a facility with future bike lanes in the city's bike plan, and
- had an ADT of 6,800 in 2000.

In a zone to the east of the demonstration area, McLoughlin

Implementation

- Priorities
  - Safety
  - Access
  - Aesthetics
  - Equity



http://www.pedbikeimages.org/ - Dan Burden

Implementation

- Funding
  - Consensus on Priorities
  - Dedication
  - Spark Plugs
  - Leveraging

http://www.pedbikeimages.org/ - Austin Brown

Implementation

- Implementation Strategies
  - Routine Accommodation
  - Developer Requirements and Incentives
  - Annual Programs
  - Public/Private Partnerships

http://www.pedbikeimages.org/ - Tiffany Robinson

Thank you!

- Archive at http://www.pedbikeinfo.org/webinars/
  - Downloadable/streaming recording and presentation slides
- Questions?
  - Carl Sundstrom: sundstrom@hsrc.unc.edu
  - Dan Nabors: dnabors@vhb.com
  - Peter Lagerwey: plagerwey@tooledesign.com
  - General: webinars@hsrc.unc.edu
- Check out BIKESAFE: www.pedbikesafe.org/BIKESAFE/

Questions?

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- **Questions?**
  - **Tamara Redmon**
    tamara.redmon@dot.gov
  - **Carl Sundstrom**
    sundstrom@hsrc.unc.edu
  - **Dan Nabors**
    dnabors@vhb.com
  - **Peter Lagerwey**
    plagerwey@tooledesign.com