U.S. Department of Transportation
Federal Highway Administration

Pedestrian and Bicycle Information Center

How-to-Develop a Pedestrian Safety Action Plan

Data Collection and Analysis

Presented by:

Charlie Zegeer
Director, PBIC

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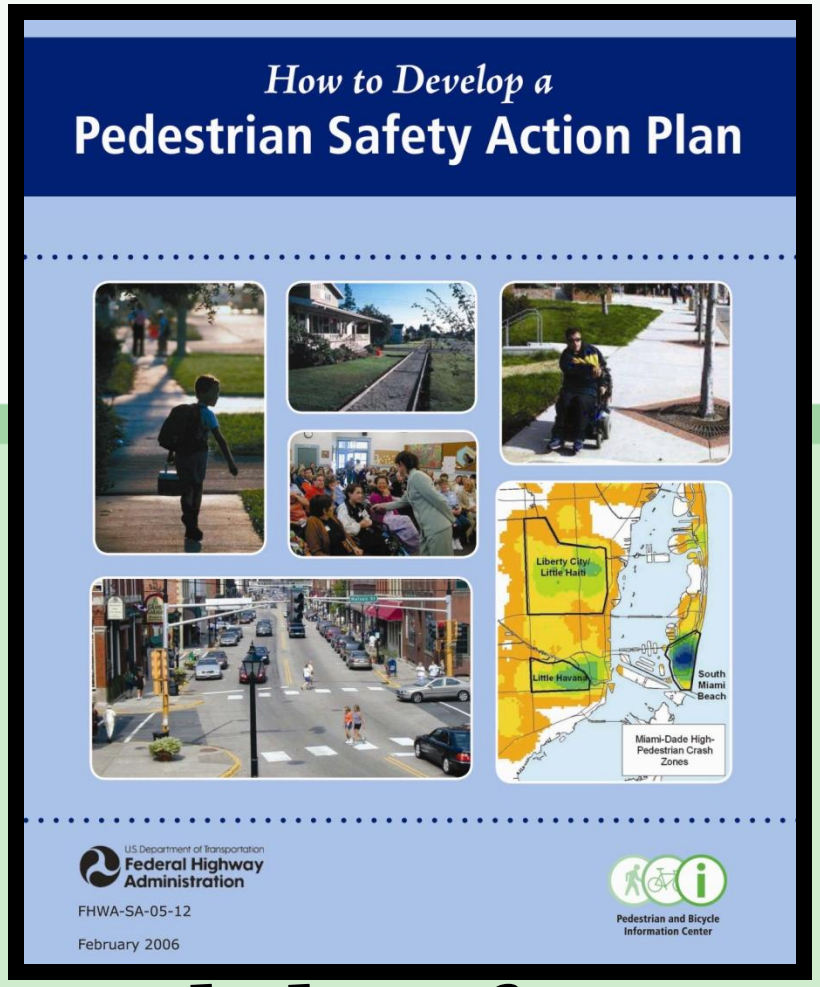
U.S. Department of Transportation
Federal Highway Administration

Pedestrian and Bicycle Information Center



Workshop for Developing a Pedestrian Safety Action Plan

Collecting Data to Identify Pedestrian Safety Problems

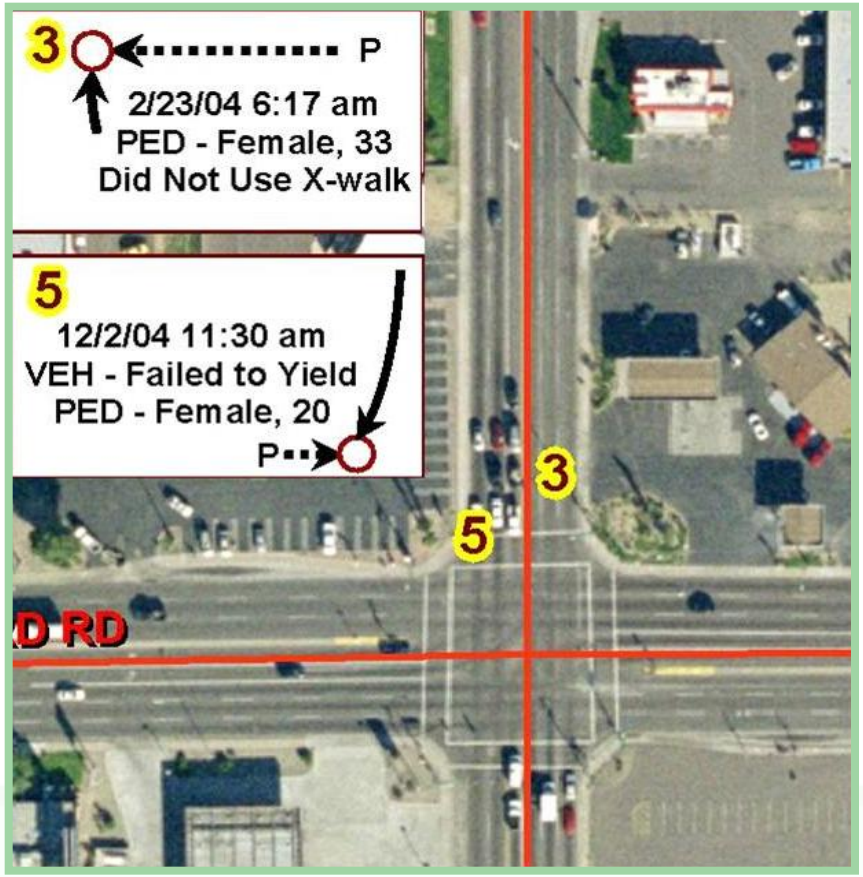
Learning Objectives

At the end of this module, you will be able to:

- **Describe WHAT and HOW meaningful and useful data needs to be identified, collected, and integrated to develop and implement your Pedestrian Safety Action Plan.**

Subjects Covered

- Data Collection Goals
- Data Collection Guidelines
- Types of Safety Projects
- Types of data – beyond crash reports



Data Collection Goals

- Identify high crash locations, corridors, areas
- Identify locations, corridors, areas with high crash potential
- Prioritize high crash locations, corridors, areas
- Identify appropriate treatments

Data Collection Guidelines

- ⇨ Be sure to go to the field site and observe conditions
- ⇨ Collect only what you need
- ⇨ Collect only what you can use
  - Do you need 5 years' worth of data if 3 years' worth give you a good idea of the problem?
  - Do you need crash data for the entire state to be collected if you're focused on a small area?
  - Do you need detailed reports if the raw numbers give a good picture of the problem?
  - But don't jump to conclusions too soon: incomplete data could give a false perspective of the problem

Data Collection Guidelines

- **Timely crash data**
  - Try to get the most recent data possible
  - Make sure they go back far enough to be representative (min 3 years)
  - Don’t go too far back: conditions change over time

Types of Safety Projects

1. Spot Locations (individual intersections and non-intersections)
2. Corridors (½ mile to 5 or more miles in length)
3. Targeted Areas (neighborhood, business district, or large area where pedestrian crashes are high)
4. Entire Jurisdictions (addressed through system-wide changes)

Types of Safety Projects: Spot Locations

Example: Single intersection with high crash rate

Types of Safety Projects: Corridors

Example: Long corridor with high crash rate

Corridors Solutions Are Repeatable

Types of Safety Projects: Targeted Areas

Example: midblock dash in CBD

Types of Safety Projects: Entire Jurisdiction

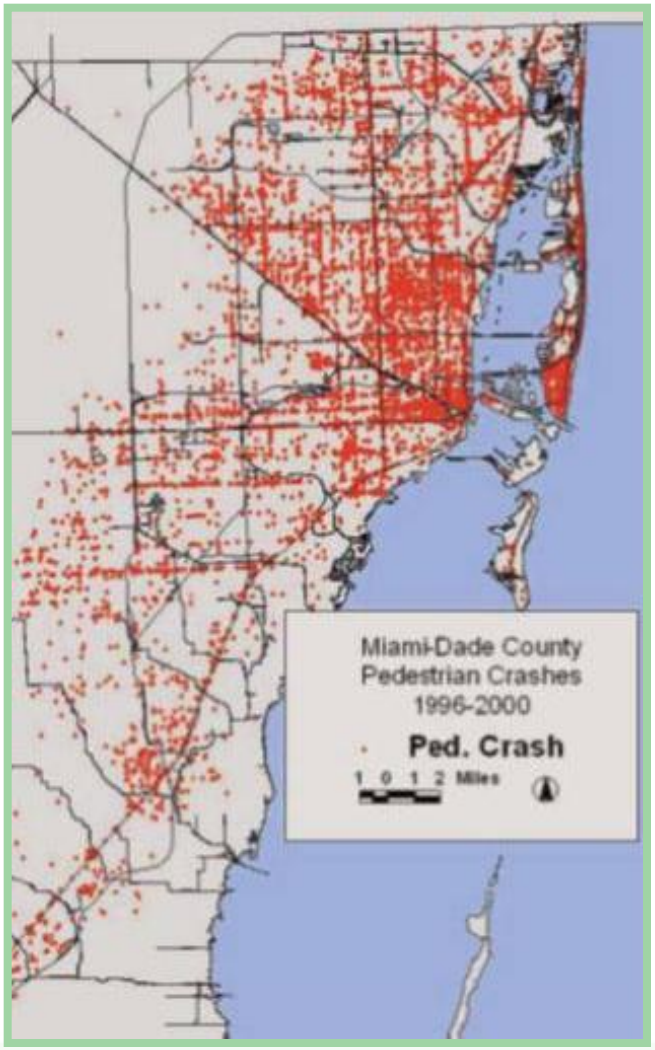
Example: Lack of ped heads at signals

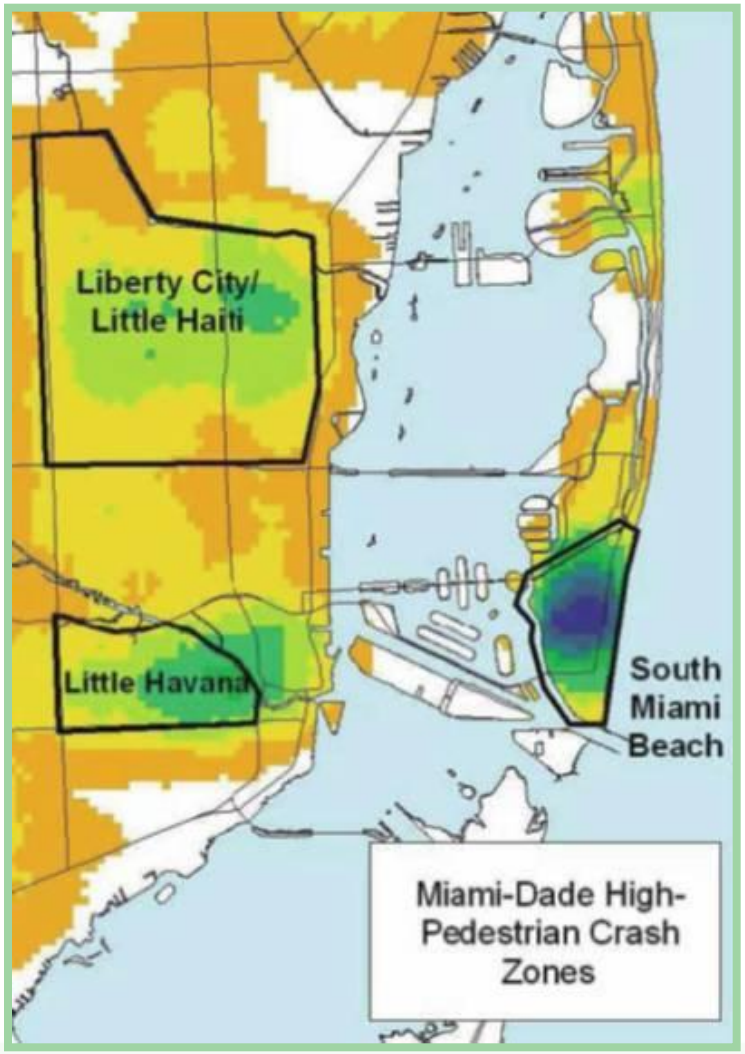
Why is this important?

- You don't need to collect all pedestrian crash data and exposure data (pedestrian counts) for the entire system before you can start solving problems
- If a pedestrian safety problem has been identified as one of these 4 types, you can collect limited data and start implementing countermeasures right away

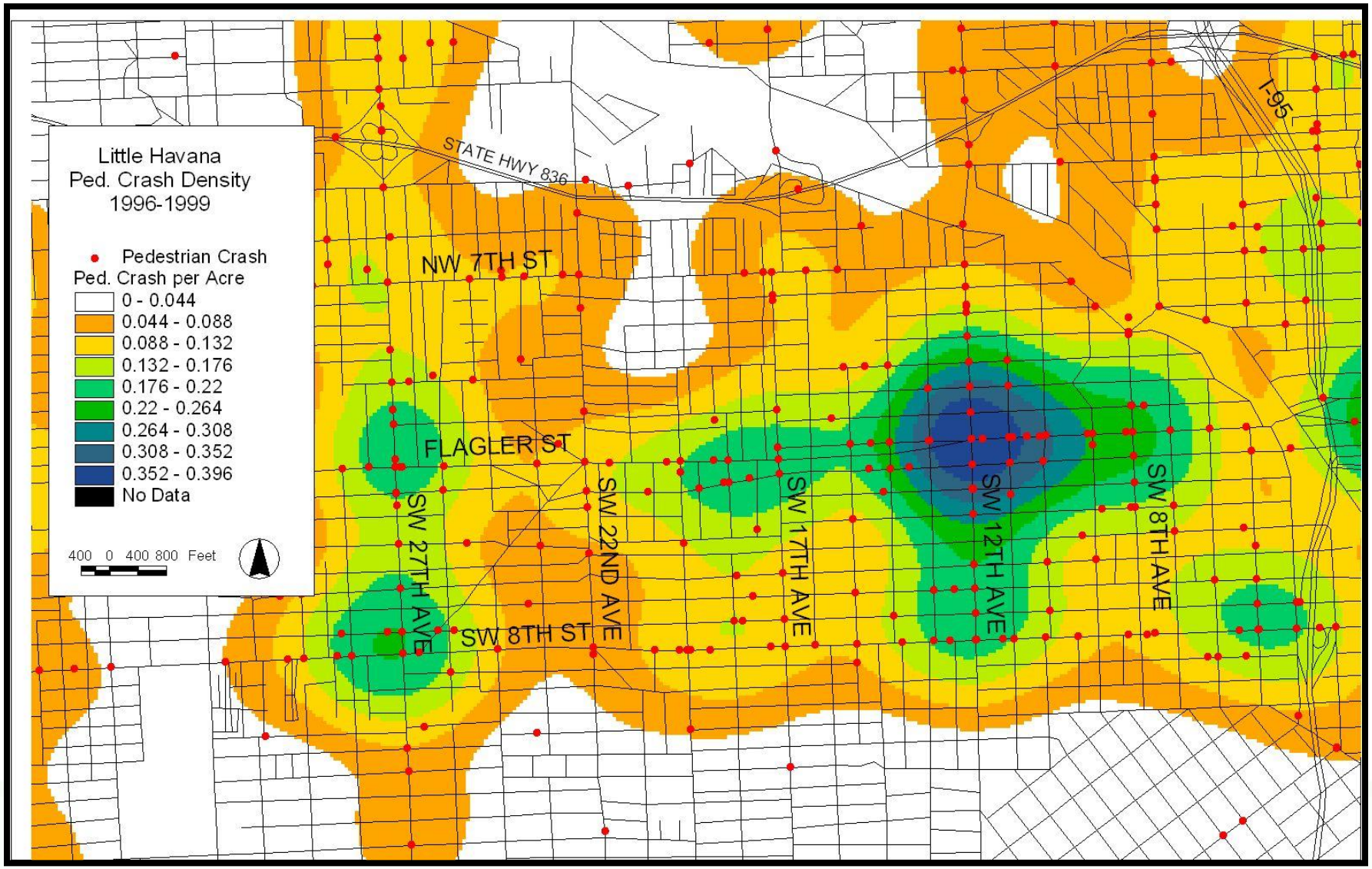
How to figure out extent of problem

Plot crashes on a map: Corridor problem





Plot crashes on a map: Area-wide problem



Example Community: Miami-Dade County, FL

Collecting Data to Identify Pedestrian Safety Problems

Identify and quantify pedestrian safety deficiencies:

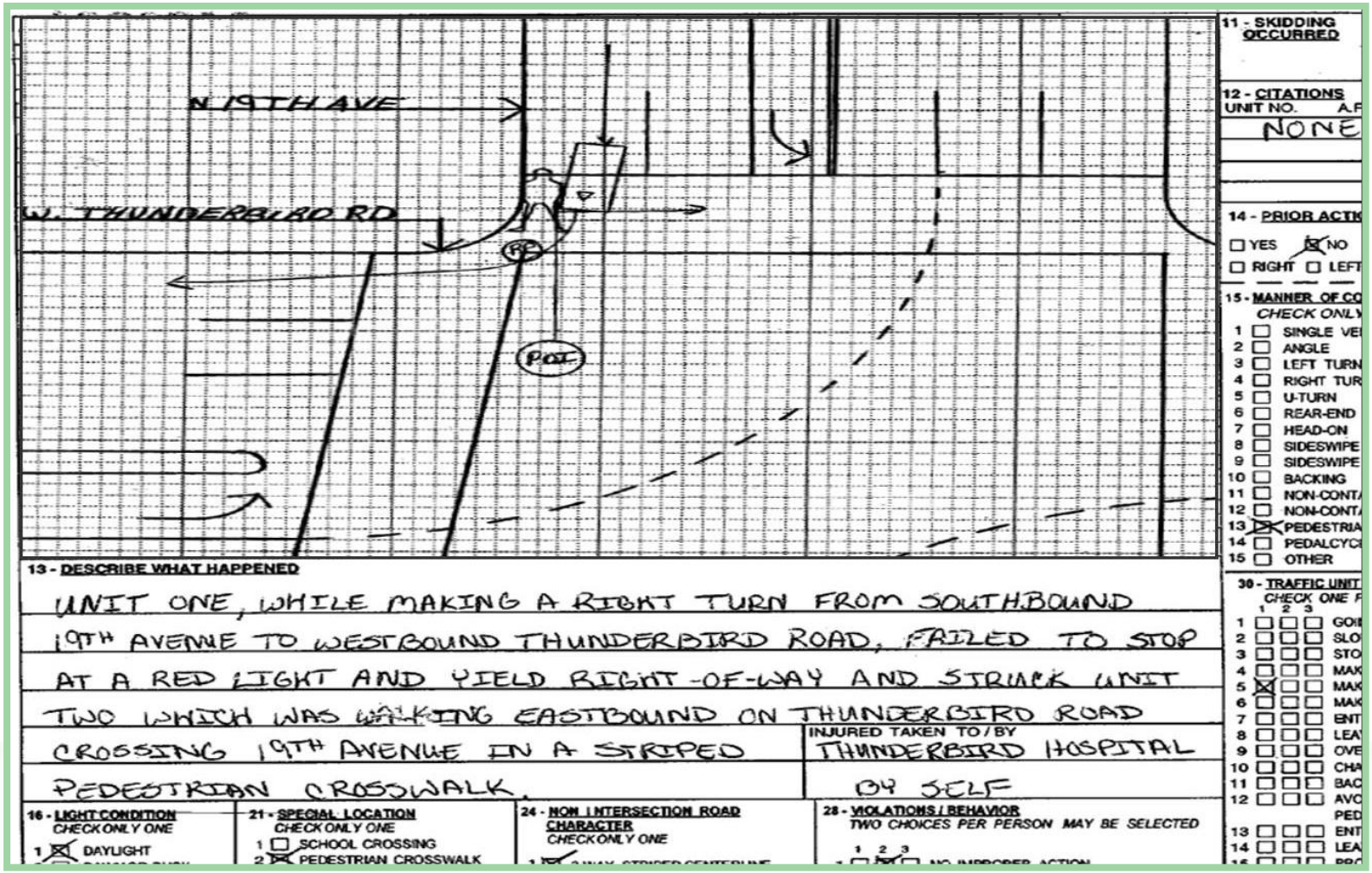
- ⇨ Collision data: Computerized records and police reports
- ⇨ Roadway/Sidewalk inventories
- ⇨ Traffic characteristics
- ⇨ Pedestrian counts and behavioral studies
- ⇨ Pedestrian policies and guidelines
- ⇨ Pedestrian surveys
- ⇨ Needs assessments
- ⇨ Make a site visit

Collision Data: Computerized Records And Police Reports

Elements of a good crash database:

- ⇨ **Includes ALL available pedestrian crashes**
- ⇨ **Timely**
- ⇨ **Accurate (requires review of police narrative)**
- ⇨ **Computerized (with programs to assist in identifying problem locations)**
- ⇨ **Recommended to routinely geo-code all pedestrian crashes**

Collision Data: Police Reports

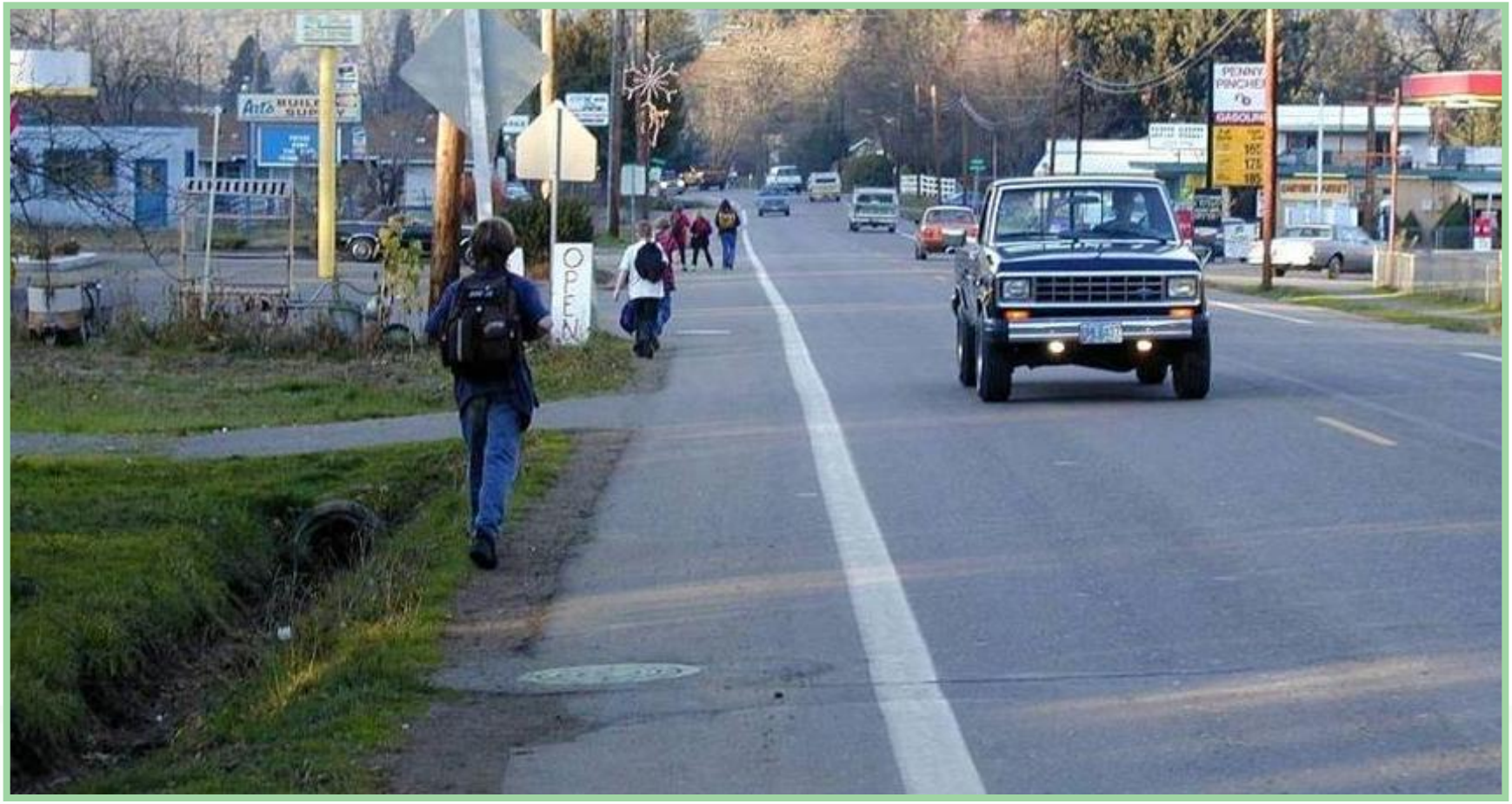


Roadway/Sidewalk Inventories

- ⇨ Missing sidewalks
- ⇨ Road and Traffic Characteristics
  - ADT
  - Width
  - Speed
- ⇨ Pedestrian counts & surveys

These should result in Needs Assessment

Roadway/Sidewalk Inventories
Missing Sidewalks



Roadway/Sidewalk Inventories
Road Characteristics

Wide street

Roadway/Sidewalk Inventories
Traffic Characteristics

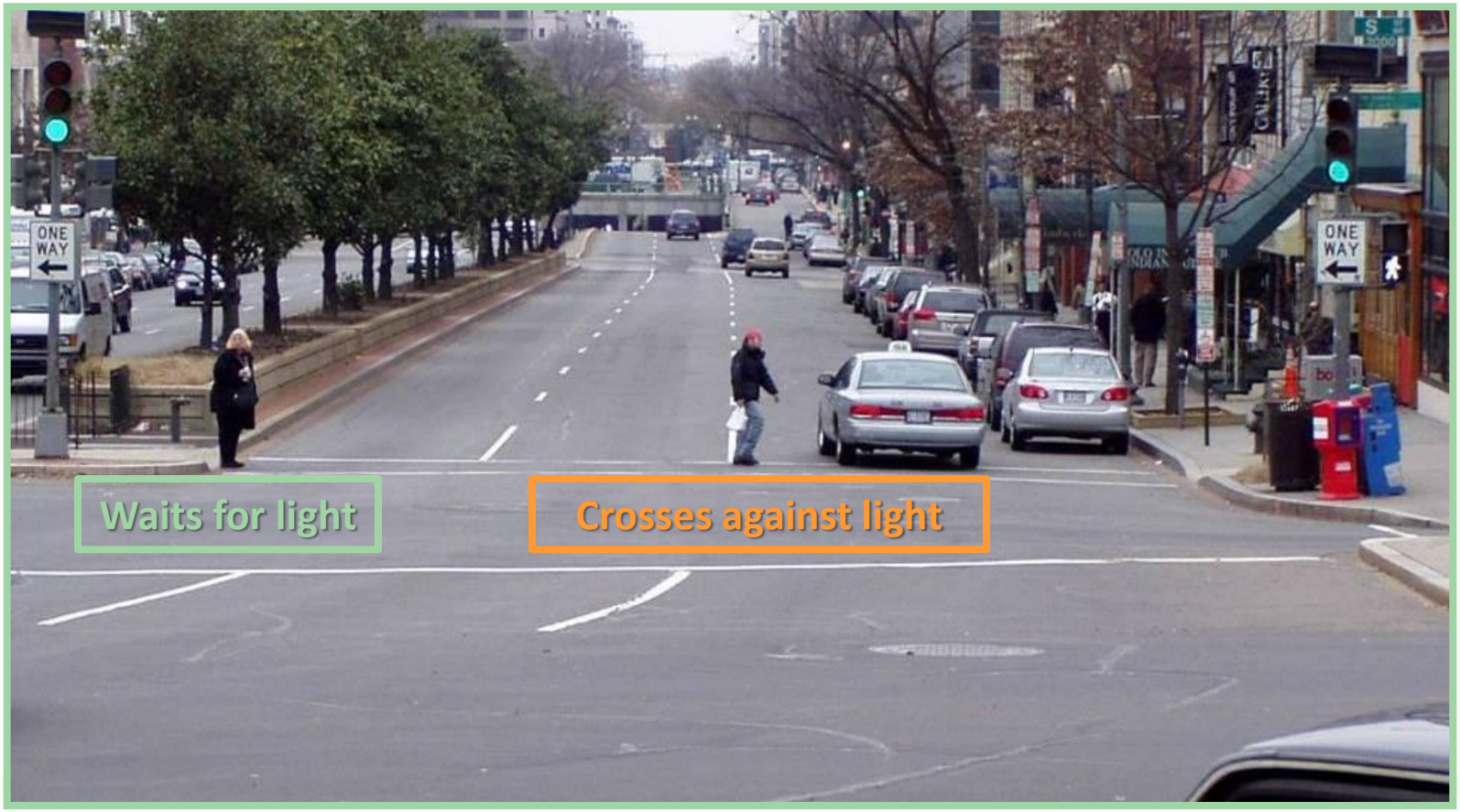
Busy street

Behavior Studies

Human Factors: Beyond the Data:

- ⇨ **The "Design Pedestrian" and Characteristics of Pedestrian Travel**
- ⇨ **Characteristics of the Driver**
- ⇨ **Walking Level of Quality/Level of Service (LOQ/LOS)**

Human Factors: Beyond the Data



Characteristics of Pedestrians

Human Factors: Beyond the Data

Characteristics of Drivers

Human Factors: Beyond the Data

Walking Level of Quality/Level of Service (LOQ/LOS)

Walking Level of Quality/Level of Service (LOQ/LOS)

Rich walking environment – high ped LOS

Collecting Data Summary

1. Pedestrian safety problems should be identified and sorted by spot locations, corridors or jurisdictional problems
2. Collision data should be recorded in a timely manner
3. Pedestrians and drivers should be observed in the field
4. The data should be related to the pedestrian environment

Learning Objectives

You should be able to:

⇨**Describe WHAT and HOW meaningful and useful data needs to be identified, collected, and integrateed to develop and implement your Pedestrian Safety Action Plan.**

Questions?

Analyzing Information and Prioritizing Concerns

Learning Objectives

At the end of this module, you should be able to:

- ⇨ Describe HOW to analyze and integrate the data to develop and implement your Pedestrian Safety Action Plan.

Subjects Covered

- Categorizing Pedestrian Safety Concerns
- Identifying high-crash locations
- Selecting Appropriate Countermeasures
- Determining the Extent of Implementation
- Prioritizing Pedestrian Improvements

Categorizing Concerns for Pedestrian Safety

Same as before:

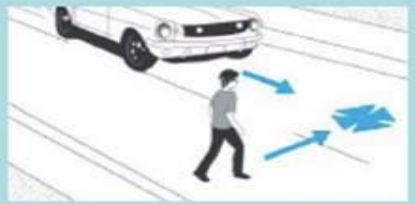
- ⇨ **Spot Locations (individual intersections and non-intersections)**
- ⇨ **Corridors (½ mile to 5 or more miles in length)**
- ⇨ **Targeted Areas (a neighborhood, business district, or a large area where pedestrian crashes are high)**
- ⇨ **Entire Jurisdictions (addressed through system-wide changes)**

Crash Typing

Available tools:

- ⇨ PBCAT software
- ⇨ Field reviews
- ⇨ Roadway Safety Audits

1. Dart/Dash
The pedestrian walked or ran into the roadway at an intersection or midblock location and was struck by a vehicle. The motorist's view of the pedestrian may have been blocked until an instant before the impact.



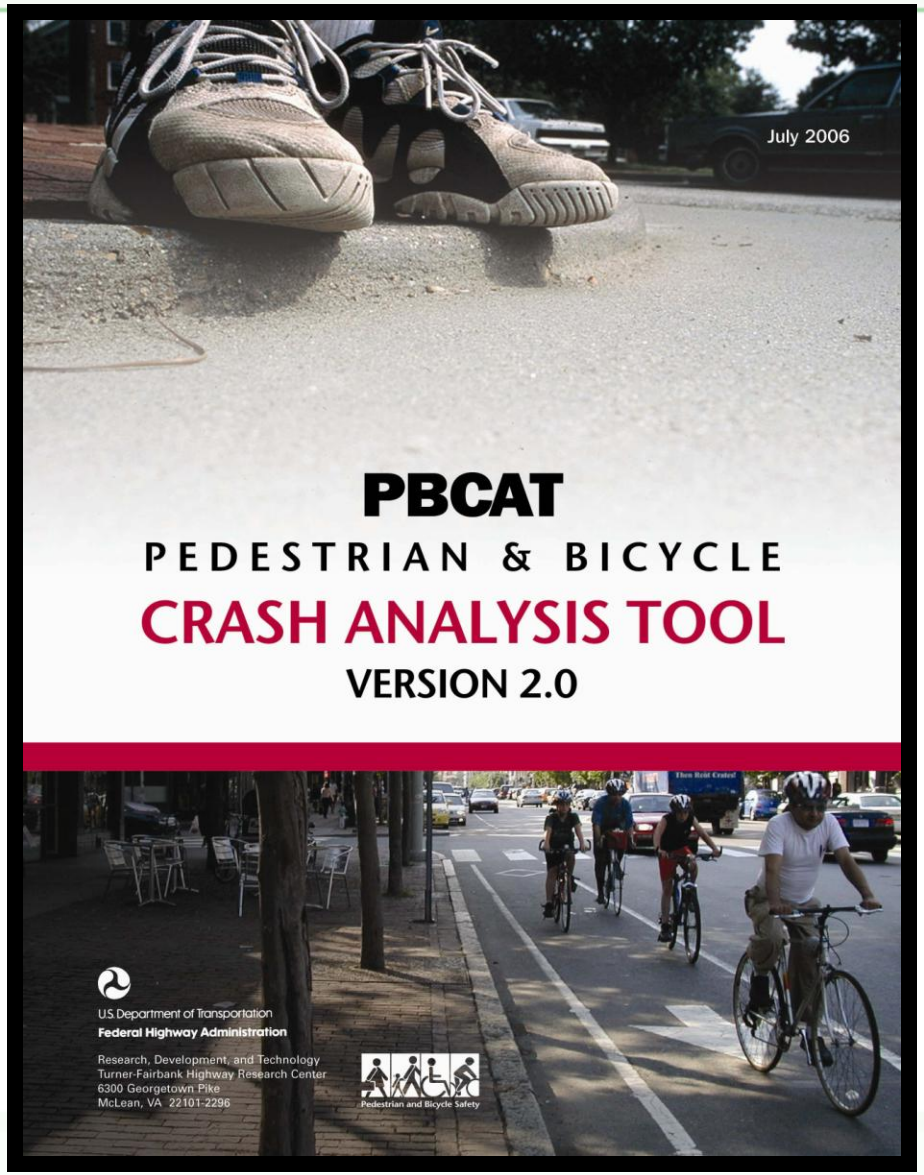
2. Multiple Threat/Trapped
The pedestrian entered the roadway in front of stopped or slowed traffic and was struck by a multiple-threat vehicle in an adjacent lane after becoming trapped in the middle of the roadway.

3. Through Vehicle at Unsignalized Location
The pedestrian was struck at an unsignalized intersection or midblock location. Either the motorist or the pedestrian may have failed to yield.

4. Turning Vehicle
The pedestrian was attempting to cross at an intersection, driveway, or alley and was struck by a vehicle that was turning right or left.

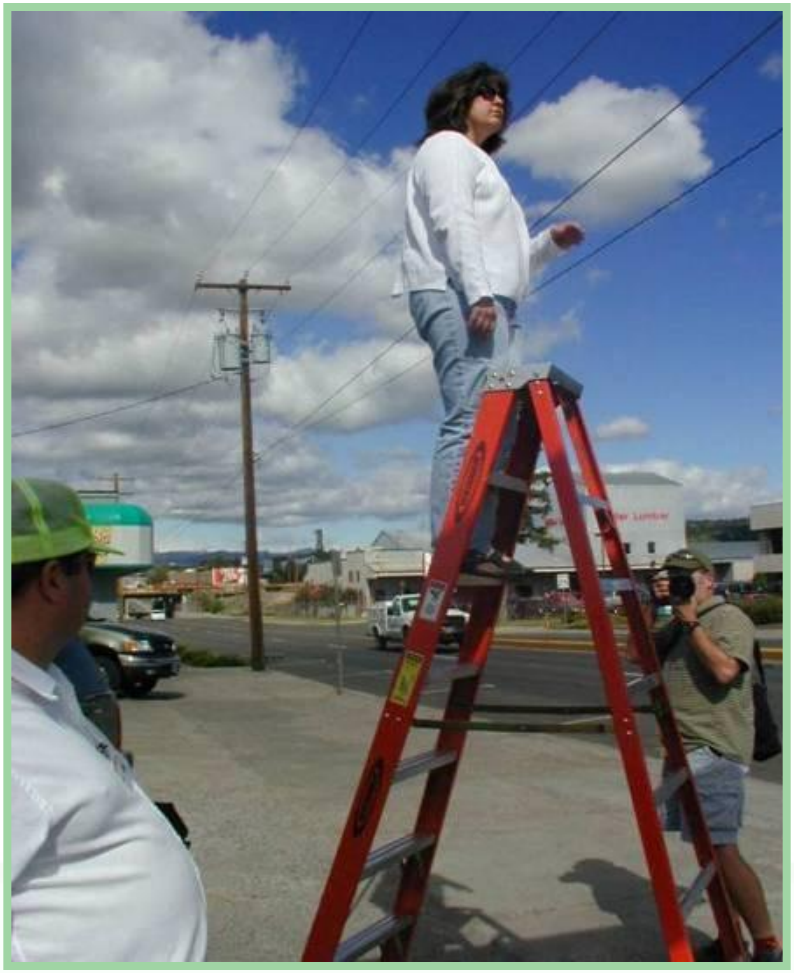
5. Through Vehicle at Signalized Location
The pedestrian was struck at a signalized intersection or midblock location by a vehicle that was traveling straight ahead.

6. Walking Along Roadway
The pedestrian was walking or running along the roadway and was struck from the front or from behind by a vehicle.



Ped/Bike Crash Analysis Tool (PBCAT)

Field Reviews



Determining Extent of Implementation

Phasing projects:

- ⇨Geographically (treat an area or corridor)
- ⇨By urgency (potential for fatals come first)
- ⇨By opportunity (piggy-backing)
- ⇨By type of treatment (sidewalks, lighting)

Duration of Improvement:

- ⇨Short-term (temporary)
- ⇨Long-term (permanent)

Phasing Projects Geographically: Treat an Area or Corridor

Example: Series of downtown curb extensions

Phasing Projects Geographically: Treat an Area or Corridor

Example: Consider adding raised median islands

Phasing Projects by Opportunity: Piggy-backing

Example: Adding sidewalk to bridge project

Phasing Projects by Type of Treatment: Sidewalks - Lighting

Example: Building sidewalks to schools

Duration of Improvement: Short-term (temporary)

Example: Adding curbs to realign skewed intersection

Duration of Improvement: Long-term (permanent)

Example: Adding sidewalks & landscaping to realign skewed intersection

Prioritizing Pedestrian Improvements

- Overlapping priorities method
- Developing a ranking system

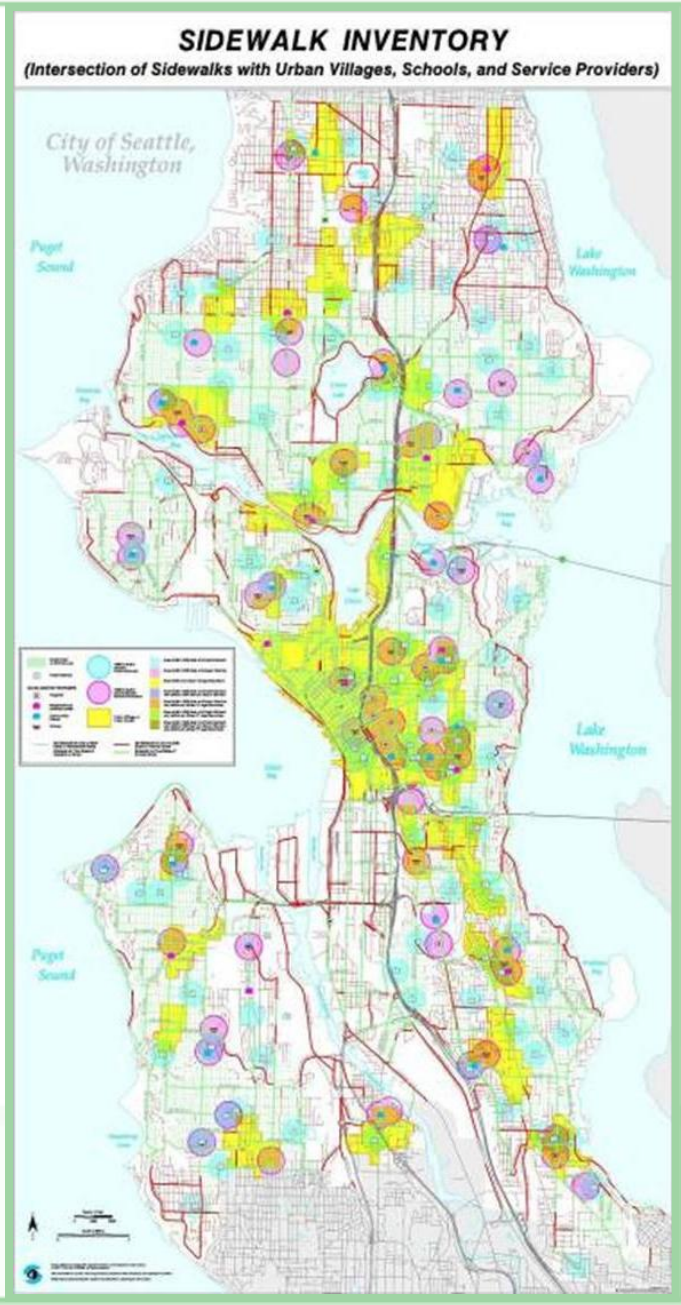
Overlapping priorities method Developing a ranking system

Sample Implementation Strategy:

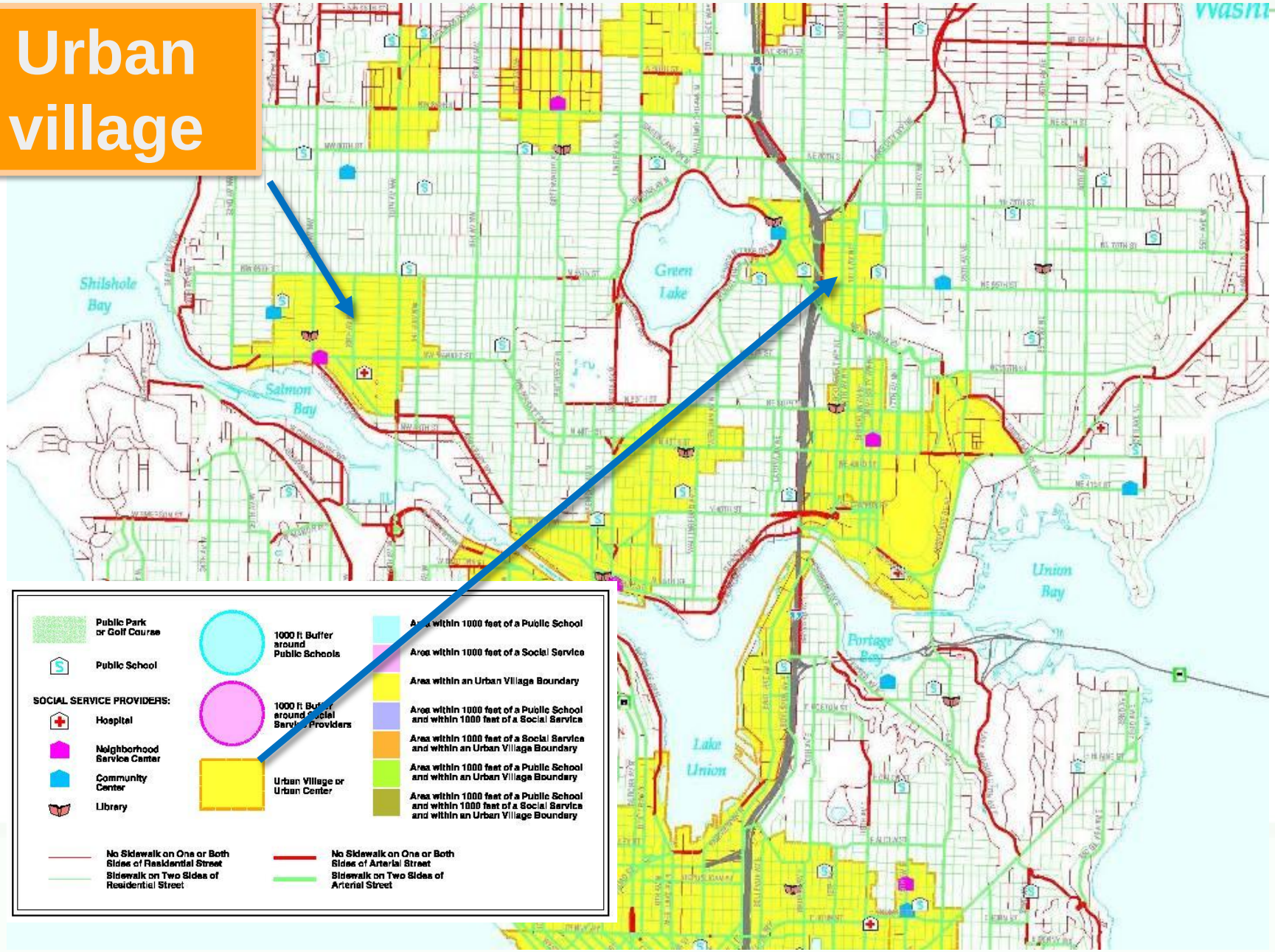
Retrofitting existing roadways with sidewalks – how to develop a program to fill in missing sections of sidewalks over 20 years

How do you make such a daunting task manageable?

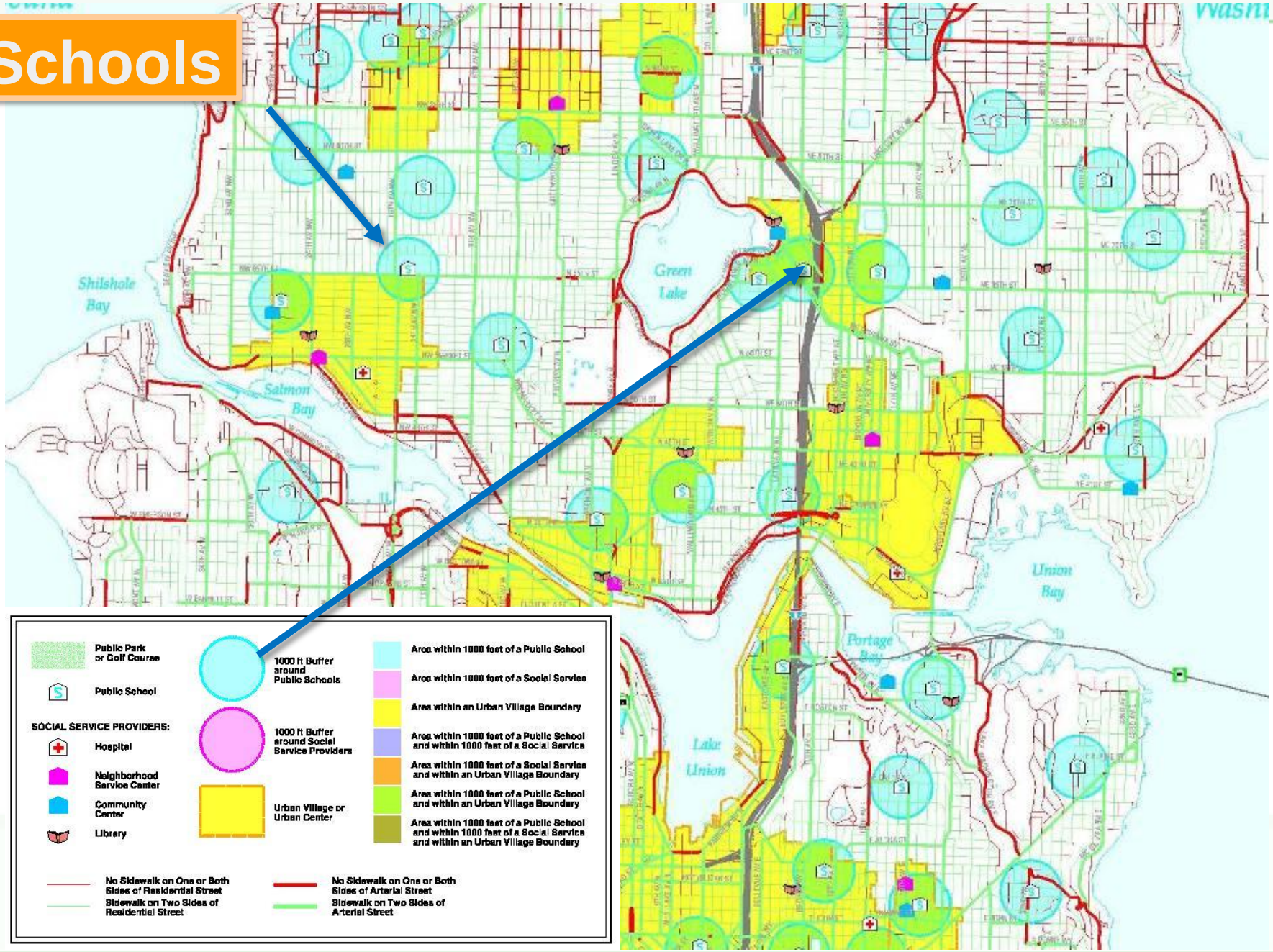
- ⇨ **Seattle example: divide it into bite-size chunks, with overlapping priorities**



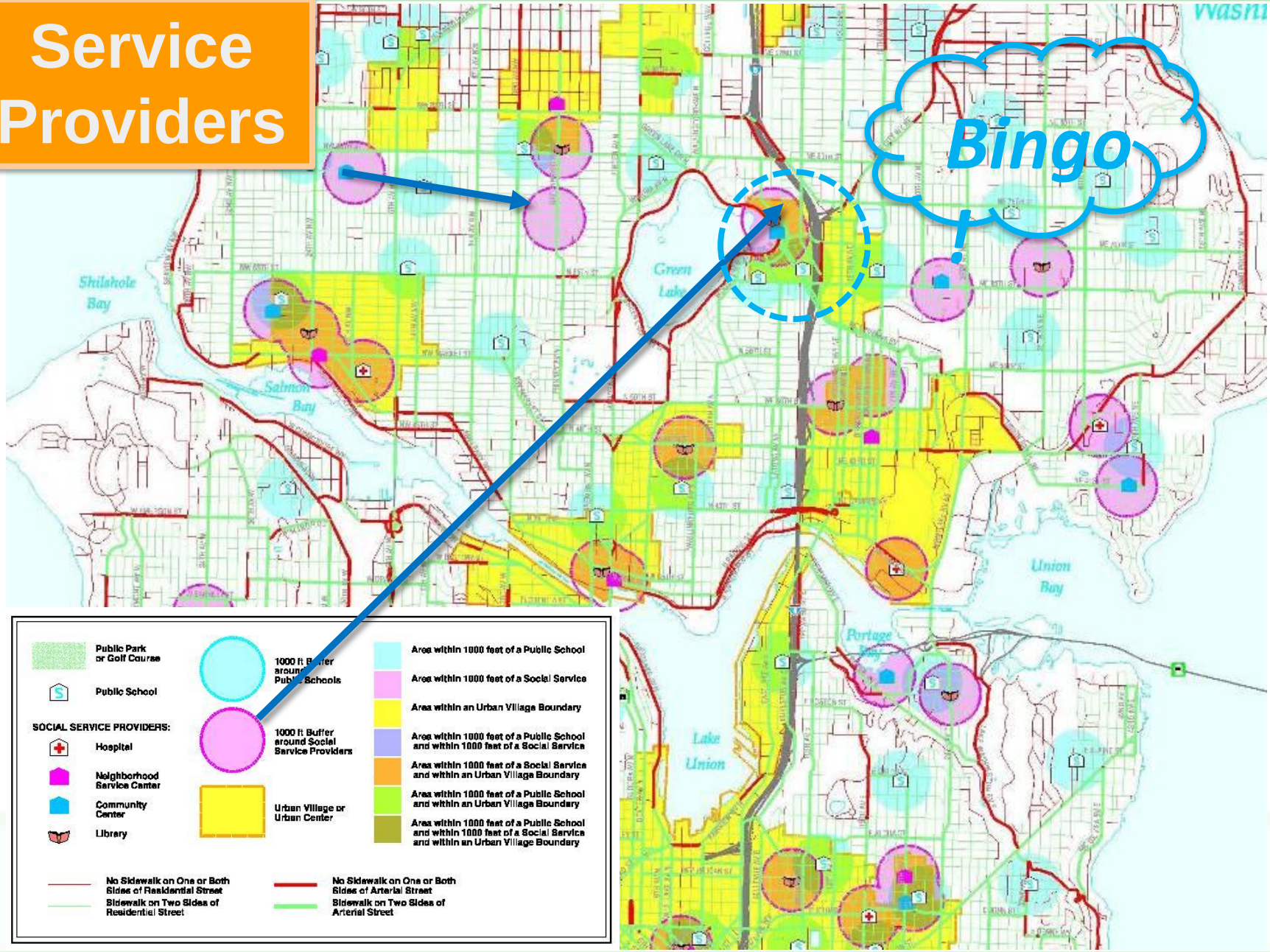
Urban village



Schools


Shilshole Bay
Green Lake
Salmon Bay
Union Bay
Portage Bay
Lake Union
Public Park or Golf Course
Public School
SOCIAL SERVICE PROVIDERS:
Hospital
Neighborhood Service Center
Community Center
Library
1000 ft Buffer around Public Schools
1000 ft Buffer around Social Service Providers
Urban Village or Urban Center
Area within 1000 feet of a Public School
Area within 1000 feet of a Social Service
Area within an Urban Village Boundary
Area within 1000 feet of a Public School and within 1000 feet of a Social Service
Area within 1000 feet of a Social Service and within an Urban Village Boundary
Area within 1000 feet of a Public School and within an Urban Village Boundary
Area within 1000 feet of a Public School and within 1000 feet of a Social Service and within an Urban Village Boundary
No Sidewalk on One or Both Sides of Residential Street
Sidewalk on Two Sides of Residential Street
No Sidewalk on One or Both Sides of Arterial Street
Sidewalk on Two Sides of Arterial Street

Service Providers



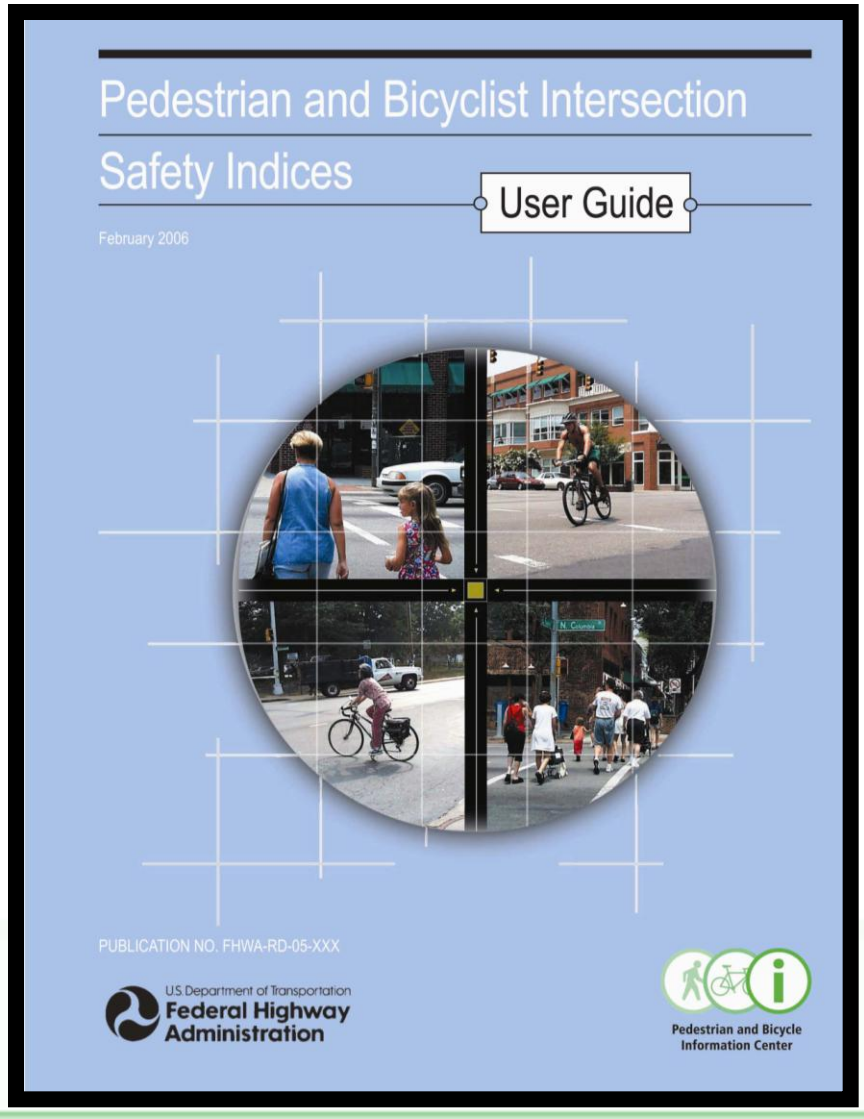
Develop a Ranking System

Category	Points
Severity of problem (how many crashes have occurred or are likely to occur)	15
Effectiveness of solution	15
Probable use (travel demand)	15
Likelihood of funding	10
Feasibility (constructability: piggy-backing, available ROW etc)	15
Public support	15
Cost	15
Bonus: achieves other goals (motorist/bicyclist safety, aesthetics)	10
Total Points	100

Summary Analyzing Information

- Data should be analyzed so it leads to positive ped safety improvements
- Implementation strategies should be developed that make use of existing resources, and that can be explained to the public and elected officials

Intersection Safety Indices



Safety Measures

- **Crashes***
- **Conflicts* – sudden change in speed or direction**
- **Avoidance maneuvers – any change in speed or direction**
- **Safety ratings – experts' rating of perceived safety**

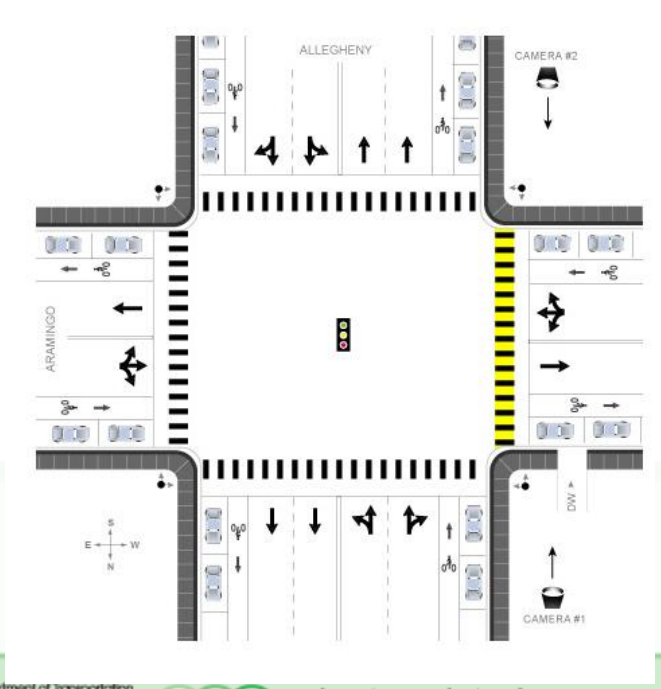
* Too few crashes and conflicts for statistical model development.

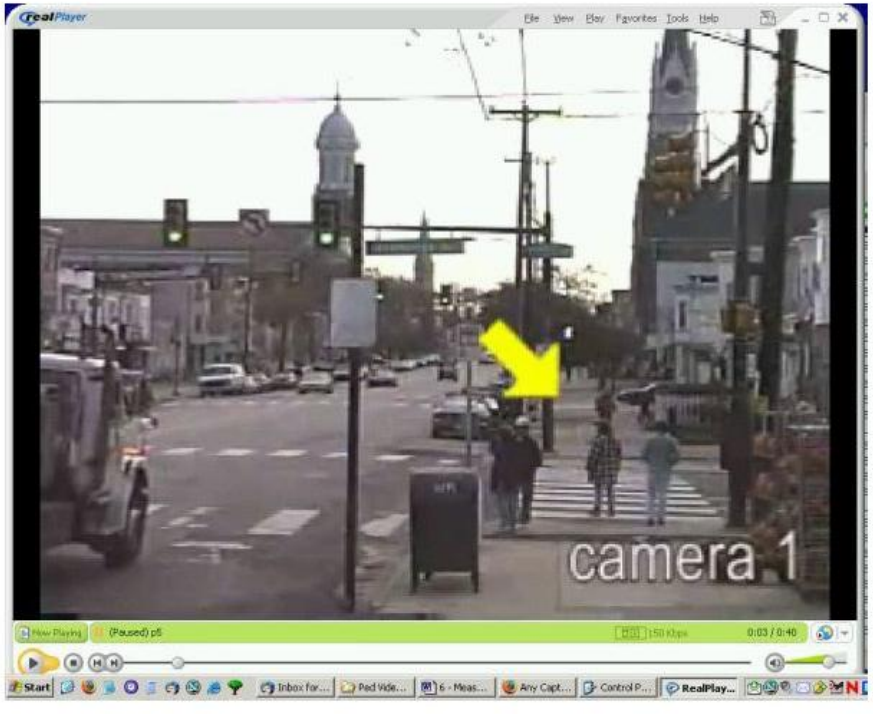
Data Collection: Physical Characteristics

- Traffic control
- Vehicle speeds
- Number of legs
- One-way/two-way
- Number of lanes
- Median islands
- Curb radii
- Driveway density
- On-street parking
- Pedestrian crossing
- Pedestrian signs and signals
- Street lighting
- Surrounding development
- RTOR allowance

Data Collection: Safety Ratings

- Each site had an intersection sketch and a video clip from one or two camera angles





Ped ISI Model

⇨ **Significant variables:**

- Presence of traffic signal (-)
- Presence of stop sign (-)
- Number of through vehicle lanes (+)
- 85th percentile vehicle speed (+)
- Main street ADT when signal present (+)
- Commercial area (+)

User Guide

- Accompanying User Guide gives practitioners tools for easy implementation of Ped and Bike ISI
- Quick Reference Tables

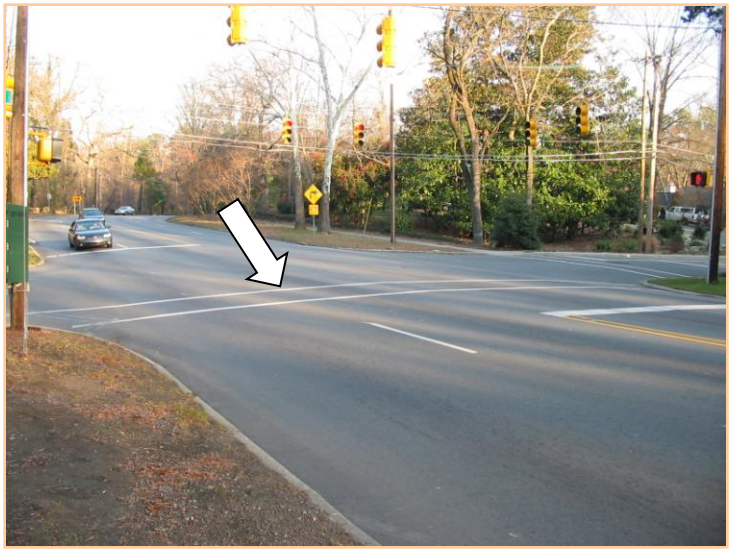
Main Rd Thru Lns		1 Through Lane					2 Through Lanes					3 Through Lanes					4 Through Lanes				
Main Rd Speed		25	30	35	40	45	25	30	35	40	45	25	30	35	40	45	25	30	35	40	45
ADT	1000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3		2.5	2.6	2.6	2.7	2.8	2.9	3.0
	5000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3		2.5	2.6	2.6	2.7	2.8	2.9	3.0
	10000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3		2.5	2.6	2.6	2.7	2.8	2.9	3.0
	15000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2		2.3	2.3		2.5	2.6	2.6	2.7	2.8	2.9	3.0
	20000												2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	25000												2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	30000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	35000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	40000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	45000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0
	50000	1.6	1.7	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0

User Guide

⇨ Spreadsheet Calculator

	A	B	D
1		**Pedestrian Safety Index Model**	
2			
3			**Crosswalk 1**
4		Name of crosswalk	Pedestrian Example #1
6	SIGNAL	Signalized (1=yes, 0=no)	1
7	STOP	Stop Controlled (1=yes, 0=no)	0
8	THRULNS	Number of Through Lanes on Main St	4
9	SPEED	85th Percentile Speed on Main St	42
10	MAINADT	Main Street ADT	22000
11	COMM	Commercial Area (1=yes, 0=no)	0
13		**Safety Index value =**	**2.7**

Pedestrian Example



Pedestrian Example

- Signalized intersection
- Four through lanes on the main road (two in each direction)
- 85th percentile speed on the main road is 42 mph
- Main road ADT is 22,000 vehicles per day
- Surrounding area is residential

Pedestrian Example

- **Ped ISI = 2.372–1.867**SIGNAL**–1.807**STOP **+ 0.335**THRULNS **+ 0.018**SPEED **+ 0.006**(MAINADT*SIGNAL) **= 0.238**COMM

- **Ped ISI = 2.372–1.867***1**–1.807***0 **+ 0.335***4 **+ 0.018***42 **+ 0.006**(22*1) **= 0.238***0

- **Ped ISI = 2.7**

Pedestrian Example

Main Rd Thru Lns		1 Through Lane					2 Through Lanes					3 Through Lanes					4 Through Lanes				
Main Rd Speed		25	30	35	40	45	25	30	35	40	45	25	30	35	40	45	25	30	35	40	45
ADT	1000	1.3	1.4	1.5	1.6	1.7	1.6	1.7	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.7
	5000	1.3	1.4	1.5	1.6	1.7	1.7	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.3	2.4	2.3	2.4	2.5	[illegible]	2.7
	10000	1.4	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.5	[illegible]	2.7
	15000	1.4	1.5	1.6	1.7	1.7	1.7	1.8	1.9	2.0	2.1	2.1	2.1	2.2	2.3	2.4	2.4	2.5	2.6	[illegible]	2.7
	20000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.6	2.7	2.8
	25000	1.4	1.5	1.6	1.7	1.8	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.4	2.5	2.4	2.5	2.6	[illegible]	2.8
	30000	1.5	1.6	1.7	1.7	1.8	1.8	1.9	2.0	2.1	2.2	2.1	2.2	2.3	2.4	2.5	2.5	2.6	2.7	2.7	2.8
	35000	1.5	1.6	1.7	1.8	1.9	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.6	2.7	2.8	2.9
	40000	1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.5	2.6	2.5	2.6	2.7	2.8	2.9
	45000	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.3	2.2	2.3	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9
	50000	1.6	1.7	1.8	1.9	2.0	1.9	2.0	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0

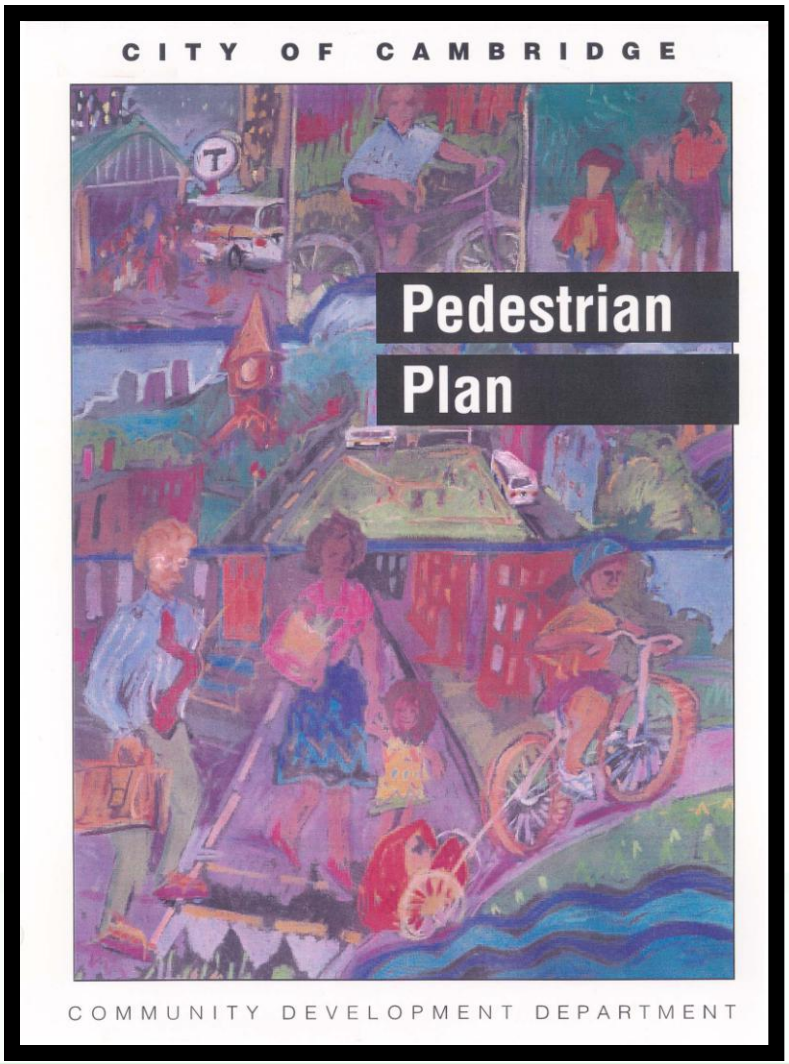
Web Links

- **Final Report:** http://www.tfhrc.gov/safety/pedbike/pubs/06125/

- **User Guide:** http://www.tfhrc.gov/safety/pedbike/pubs/06130/

www.walkinginfo.org

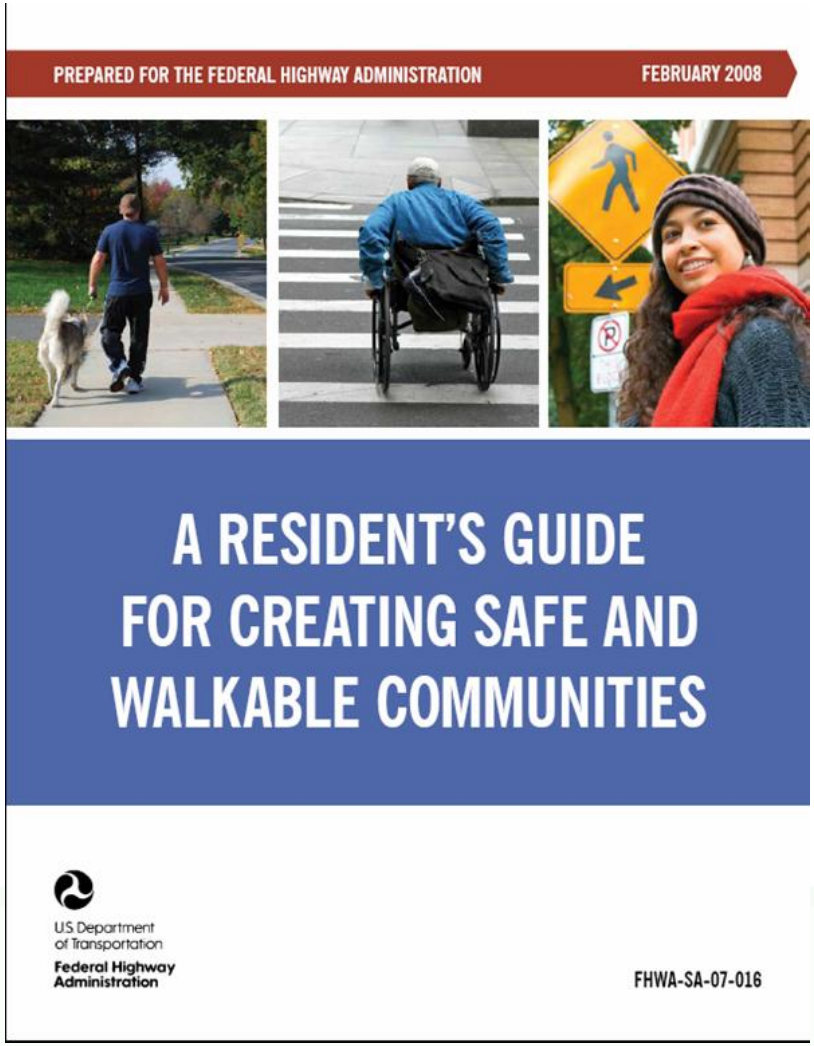
Example Pedestrian Plans



FHWA Resident's Guide

Resident Guide Features

- Developed user-friendly Guide
- Focuses on community activities
- Builds vocabulary for working with locals
- Increases efficiency and communication



Designing for Pedestrian Safety Workshop

Learning Objectives

You should be able to:

⇨ **Describe HOW to analyze and integrate the data to develop and implement your Pedestrian Safety Action Plan.**

Questions?

Contact Info:

Charlie Zegeer

PBIC Director

Charlie_zegeer@unc.edu

(919) 962-7801

www.walkinginfo.org