

# Context Sensitive Design for Nonmotorized Facilities

Norman Cox, ASLA, The Greenway Collaborative, Inc.

## Context Sensitive Design for Nonmotorized Facilities



Norman Cox, ASLA  
The Greenway Collaborative, Inc.  
Ann Arbor, Michigan

Presentation will be posted on-line Monday

## St. Clair County Nonmotorized Guidelines

- Michigan Department of Transportation Project
  - Context Sensitive Solutions Directive
- Builds on Three Key Documents:
  - MDOT's Southwest Michigan Nonmotorized Investment Plan
  - New County Master Plan
  - New Long-Range Transportation Plan



Done at the Transportation Service Center Level as a Pilot Project – First Step

## Key Elements of the Project

- Set General Policy
- Define Prevailing Guidelines
- Develop Context Based Guidelines
- Create Decision Support Tools
- Define Appropriate Staff Training and Resources
- Implementation and Funding Guidelines
- Composite Design Guidelines



Portable to Other Areas and Local Level Agencies

## Nonmotorized Accommodation Policy

- FHWA Model:
- Include Bike and Ped. Facilities in New and Reconstruction Projects in Urban Areas – Few Exceptions
  - Pave Shoulders in Rural Areas
  - Anticipate Future Demand
  - Address Crossing the Road
  - Get Exceptions at Senior Level
  - Use Best Currently Available Guidelines



Bottom Line – Incorporate Bicycles and Pedestrians in All Non-freeway Projects as a Matter of Course

## Prevailing Nonmotorized Guidelines

- AASHTO Green Book Calls for Incorporating Bicycles and Pedestrians
- AASHTO Bike and Ped. Guides Incorporated by Reference
  - No Conflicts with Michigan Design Manual or Local Agency Guidelines
  - Little Guidance on Bike Lane Width
  - Minimal Coordination Between AASHTO Guides and Current MUTCD
  - Vague on Some Issues of Context



## Eight Landscape Types (Context)

- Rural:
  - Rural Agricultural
  - Rural Residential
  - Rural Activity Center
- Transition:
  - Suburban Fringe/Transitional
- Urban:
  - Suburban
  - General Urban
  - Commercial Center
  - Regional Commercial Center



Same Idea as Duany's "Transect"... but for the Real World




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## Context Based Guidelines

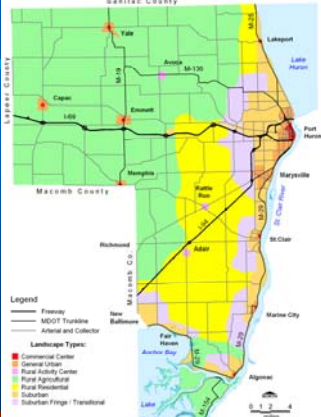
- For Each Landscape, Typical Approaches Are Defined For:
  - Shoulder / Bike Lanes
  - Sidewalks / Buffers
  - Signalized Intersections
  - Mid-block Crossings
  - Bridges
  - Independent Paths



But Context Changes Over Time and Some Projects Have Extended Periods of Service

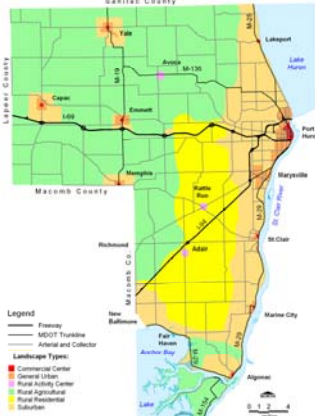
## Near-term

- For Resurfacing, Restoration & Rehabilitation (3R) and Preventative Maintenance (PM) Projects
- Shows Likely Near-term Growth Areas
  - Currently Developing Areas
  - Schools
  - Suburban Interchange Area



## Long-term

- For New and Reconstruction Projects
- Reflects County Vision and Zoning
- Reflects 2030 Long Range Transportation Plan



## Eight Landscapes

Most Rural ← → Most Urban

	Rural & Agricultural	Rural Residential	Rural Activity Center	Suburban Fringe / Transitional	Suburban	General Urban	Commercial Center	Regional Commercial Center
<b>Density</b> Population & Jobs	[Increasing from left to right]							
<b>Water and Sewer Service</b>	Planned or Existing				[Increasing from left to right]			
<b>Transit Service</b> Frequency	[Increasing from left to right]				1 Hour	30 Min.	30 Min.	15 Min.
<b>Roadway</b> Signal Spacing Number of Lanes	< 5 Mi.	< 2 Mi.	< 5 Mi.	< 1 Mi.	½ - 1 Mi.	¼ - ½ Mi.	< ¼ Mi.	
<b>Motor Vehicle</b> Speed Volume	[Increasing from left to right]							
<b>Bicyclist</b> Type of Facility Width	Paved		Shoulder	Bike Lane				
<b>Pedestrian</b> Mid-block Crossings Sidewalk Width	[Increasing from left to right]							

## The Suburban “Perfect Storm”

	Rural & Agricultural	Rural Residential	Rural Activity Center	Suburban Fringe / Transitional	Suburban	General Urban	Commercial Center	Regional Commercial Center
<b>Density</b> Population & Jobs	[Increasing from left to right]							
<b>Water and Sewer Service</b>	Planned or Existing				[Increasing from left to right]			
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<b>Motor Vehicle</b> Speed Volume	[Increasing from left to right]							
<b>Bicyclist</b> Type of Facility Width	Paved		Shoulder	Bike Lane				
<b>Pedestrian</b> Mid-block Crossings Sidewalk Width	[Increasing from left to right]							

## Suburban Landscape Table Example

Typical Planning and Demographics Classifications

County Generalized Master Plans and Zoning Plans Land Uses:	Single Family Residential, High Density, Multi-Family Residential, Business and Commercial, Industrial, Warehouse, & Light Manufacturing
County Vision Future Land Use:	Urban Area
Housing Density:	2 dwelling units per acre
Population Density:	5 persons per acre 3,200 persons per square mile
Job Density:	2 jobs per acre
Water and/or Sewer System:	Yes
Transit Service:	Dial-A-Ride, Non-existent or heavily subsidized scheduled service
Smartcode Tract Equivalent:	T3

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## Suburban Landscape Table Example

### Typical Road Conditions and Recommended Nonmotorized Facilities

Signal Spacing:	1/2 to 1 mile				
FDOT Class Equivalent:	Class I				
Input Assumptions	11' Lanes, 3% heavy vehicle traffic				

	ADT	Travel Lanes	Posted Speed	Bike Lane Width*	Buffer Width**	Sidewalk Width
Principal Arterial	31,000	4	35 to 45 MPH	6.0' AASHTO Min. 6.5' Min. Preferred	5' AASHTO Min. 9' Preferred	5' AASHTO Min. 8' Min. Preferred
Minor Arterial	25,000	4	35 to 45 MPH	5.0' AASHTO Min. 6.5' Min. Preferred	5' AASHTO Min. 9' Preferred	5' AASHTO Min. 8' Min. Preferred
Collector	13,500	2	30 to 40 MPH	5.0' AASHTO Min. 6.0' Min. Preferred	2' AASHTO Min. 6' Preferred	5' AASHTO Min. 6' Min. Preferred

## Suburban Landscape Table Example

### Typical Nonmotorized Facilities at Signalized Intersections

Pedestrian Signals:	Yes, wherever sidewalks are present; pedestrian activated pedestrian signals may be appropriate. Pedestrian countdown signals should be used where pedestrian crossing distance is greater than 55'.
Marked Crosswalks:	Yes, high visibility crosswalk.
Curb Extensions:	Where on-street parking is present.
Crossing Islands:	Yes, where the number of lanes at an intersection (including turn lanes) is 5 or greater.
Bicycle Detection:	If an actuated signal, use Bicycle Detector Pavement Marking in conjunction with R10-22 and adjust detector as necessary.

## Suburban Landscape Table Example

### Typical Nonmotorized Mid-block Cross Corridor Accommodations

Unsignalized Marked Crosswalks:	Where spacing between signals exceeds 660', and land use create a demand, crossing at uncontrolled locations should be expected and accommodations provided.
Crossing Islands:	Use with unsignalized crosswalks where there are more than three lanes (including left-turn lanes) or if typical delay for usable gaps exceeds 30 seconds.
Mid-block Pedestrian Actuated Signal	Consider at marked crosswalks if a Crossing Island will not reduce pedestrian delay to less than 45 seconds each way and/or there is a documented need to provide an accessible route for blind pedestrians.

## Suburban Landscape Table Example

### Typical Nonmotorized Facilities on Bridges

Bike Lane Width:	5' min. (AASHTO minimum Bike Lane width) or the recommended width of the Paved Shoulder on the approaching roadway, whichever is greater.
Barrier:	A barrier railing between motor vehicle lanes and sidewalk.
Sidewalk Width:	5' Minimum, width should correspond to or be wider than the sidewalk width on approach to account for any distance from barriers.

### Typical Independent ROW Shared-use Pathway

Width:	10' AASHTO Minimum, 12' preferred under most circumstances.
Surface:	Generally paved, although crushed may be considered due to aesthetic reasons or to discourage uses such as in-line skating or encourage certain uses such as horses.

**Other Nonmotorized Facilities**

Some roads may be marked as designated bicycle routes if they connect key destinations or are part of a nationally recognized bicycle route.

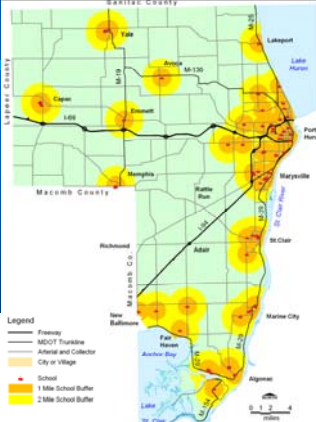
## Micro-Context Adjustments

- School Zones
- High Priority Nonmotorized Corridors



## School Zones

- If a School Zones are in a Rural Agricultural, Rural Residential, Suburban Fringe/Transitional – Build to Suburban Guidelines
- High Priority Projects
- Pedestrian Focus with-in 1 Mile, Bicycle with-in 2 Miles




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## High Priority Corridors

- Already Part of a Plan
- Improve Sooner Rather than Later
  - Pave Shoulders As Part of 3-R Projects
  - Anticipate Future Trail Crossings



The map displays Maricopa County with various transportation corridors. A legend identifies:
 

- Priority Nonmotorized Corridors: Existing Shared-Use Path, Planned Shared-Use Path, Planned Nonmotorized Facilities Improvements, Mapped Bike Paths.
- Other Areas: Major Parkland, City of Village.
- Legend: Freeway, Major Freeway, Arterial and Collector, Local Road, River, Existing Shared-Use Path, Planned Shared-Use Path, Planned Nonmotorized Facilities Improvements, Mapped Bike Paths.

## Supplemental Tools

- LOS Based Paved Shoulder and Bike Lane Width Sizing
  - Based on Motor Vehicle Speeds, Volumes and % Heavy Vehicles
- Unsignalized Marked Crosswalk
  - Elaboration on AASHTO's Most Effective Attributes
- Equestrian Issues



Address the Grey Zones

## Urban Bicycle Lane Sizing

No. of Lanes	Travel Lanes															
	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Design ADT	<250	5,000	5,000	10,000	15,000	20,000	25,000	30,000	35,000	40,000	45,000	50,000	55,000	60,000	65,000	70,000
25 mph	0	0	4.5	4.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
30 mph	0	0	4.5	5.5	6	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
35 mph	0	0	5	6	6.5	7	7	7	7	7	7	7	7	7	7	7
40 mph	0	0	5	6	6.5	7	7	7	7	7	7	7	7	7	7	7
45 mph	0	0	5.5	6.5	7	7	7	7	7	7	7	7	7	7	7	7
50 mph	0	0	5.5	6.5	7	7	7.5	6.5	7	7	7	7	7	7	7.5	7.5
55 mph	0	0	6	6.5	7	7	7.5	6.5	7	7	7	7	7	7.5	7.5	7.5

Inputs: 3% Truck Traffic

Bike Lanes wider than 7' will likely be used as parking lanes and/or travel lanes  
The width of the Bike Lane required to maintain a LOS of C is less than AASHTO's minimum

Bike Lane width: Whenever possible provide a minimum of 5' wide Bike Lane

## Training and Resources

- TSC Non-motorized Coordinator Training
  - Passed Effective Cycling Course
  - FHWA On-line Course
  - Quarterly Meetings
- All TSC Staff Training
  - Introduction to Nonmotorized Design Course
  - Introduction to Landscape Zone Based Guidelines Course
- Reference Library



Coordinators to Have Training, First Hand Experience and Readily Available Resources

## Implementation and Funding

- Specific Guidelines for New/Reconstruction, 3-R, PM and Stand Alone Projects
- Cost of In-Road Facilities Part of Project Budget
- May Include Sidewalks, Grade ROW for Future if Not Included
- Seek Local or TEA Funds for "Extras"
- Prioritize Stand Alone Projects and Utilize Nonmotorized Set-Aside Funds



Many projects are can be accomplished with new markings at a minimal cost

## Supplemental Design Guidelines

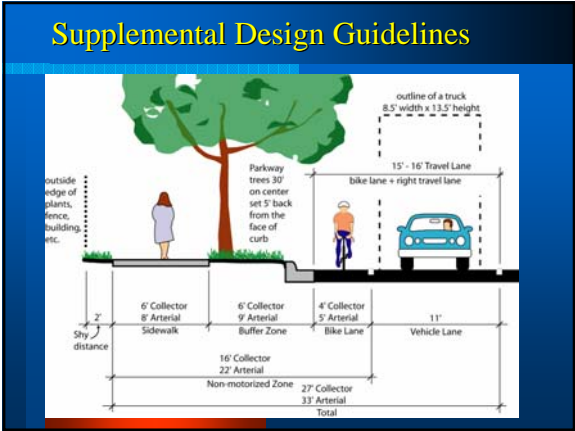
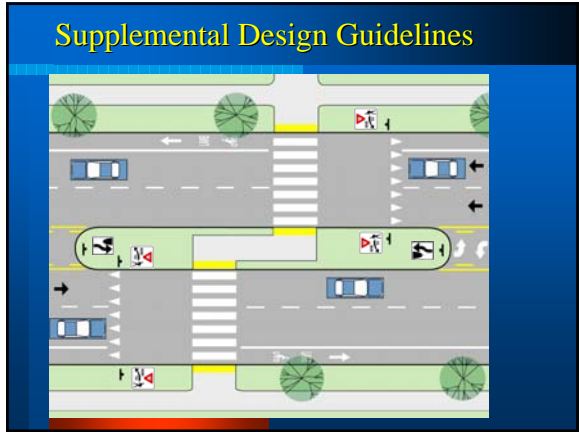
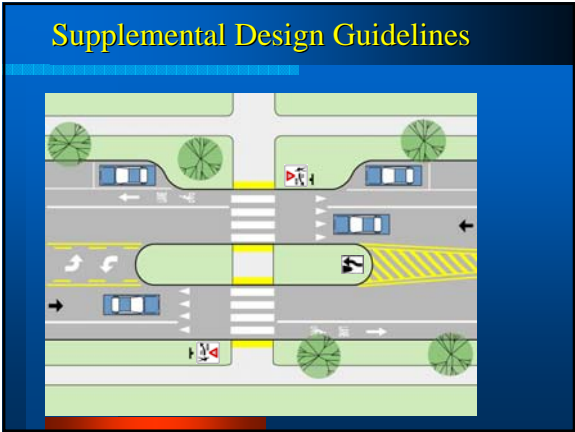
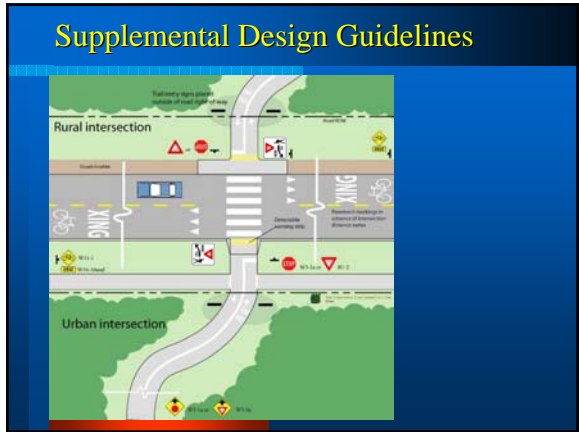
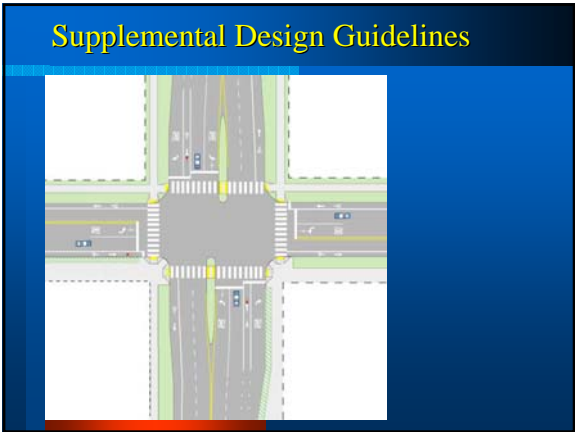
- Pedestrian and Bike Background Info
- Along Road Travel
- Across Road Travel
- Independent Pathways
- Pedestrian Travel Downtown



Combine AASHTO Green Book, AASHTO Bike, AASHTO Pedestrian, 2005 MMUTCD and ADA

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### Supplemental Design Guidelines

Urban Three-lane Multi-modal Roadway Design Guidelines

Typical Roadway Width Range:  
37' - Minimum      39' - Minimum, Desirable      47' - Upper Range

Typical Right-of-Way Width Range:  
53' - Minimum      63' - Minimum, Desirable      95' - Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
<b>Collectors</b>	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
<b>Arterials</b>	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

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## Supplemental Design Guidelines

Typical Roadway Cross-Section Guidelines:

Road Width	37'	38'	39'	40'	41'	42'	43'	44'	45'	46'	47'
Bike Lane	3.5'	3.5'	3.5'	4'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'
Travel Lane	10'	10.5'	11'	11'	11'	11'	11'	11'	11.5'	12'	12'
Center Left Turn Lane	10'	10'	10'	10'	11'	11'	11'	11'	11'	11'	12'
Travel Lane	10'	10.5'	11'	11'	11'	11'	11'	11'	11.5'	12'	12'
Bike Lane	3.5'	3.5'	3.5'	4'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'

Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

For retrofitting existing streets as well as new street construction or street reconstruction projects

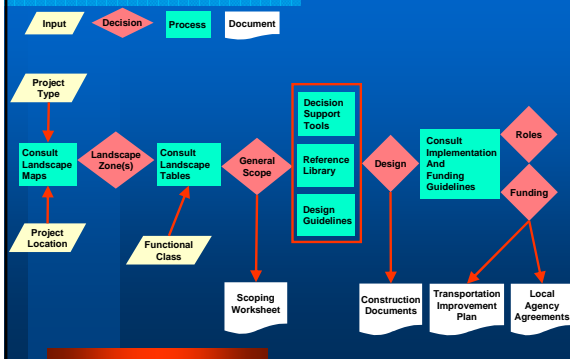
The distance is from edge-of-pavement to edge-of-pavement and assumes a standard 18" gutter

## Pulling It All Together

- Determine the Landscape Zone via the Maps
- Consult the Appropriate Table to Determine Scope
- Create Design with Decision Support Tools, Reference Library and Design Guidelines
- Set up Budgets and Local Agency Agreements Based on the Implementation and Funding Guidelines



## Project Flow Chart



## Further Information

Presentation and Report may be downloaded from:

[www.greenwaycollab.com](http://www.greenwaycollab.com)

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