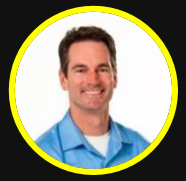
Complete Streets



Presented by:
Emiko Atherton
Mike Rutkowski, PE, AICP

Complete Streets

Complete Streets

What is it &
Why is it important?

“It breaks my heart when our transportation systems fails anyone in America because I know how much people depend on it…Part of how we measure a good, safe, decent place to live has to do with access to transportation.”

— *Anthony Foxx, Secretary of Transportation, U.S. DOT*

What are Complete Streets?

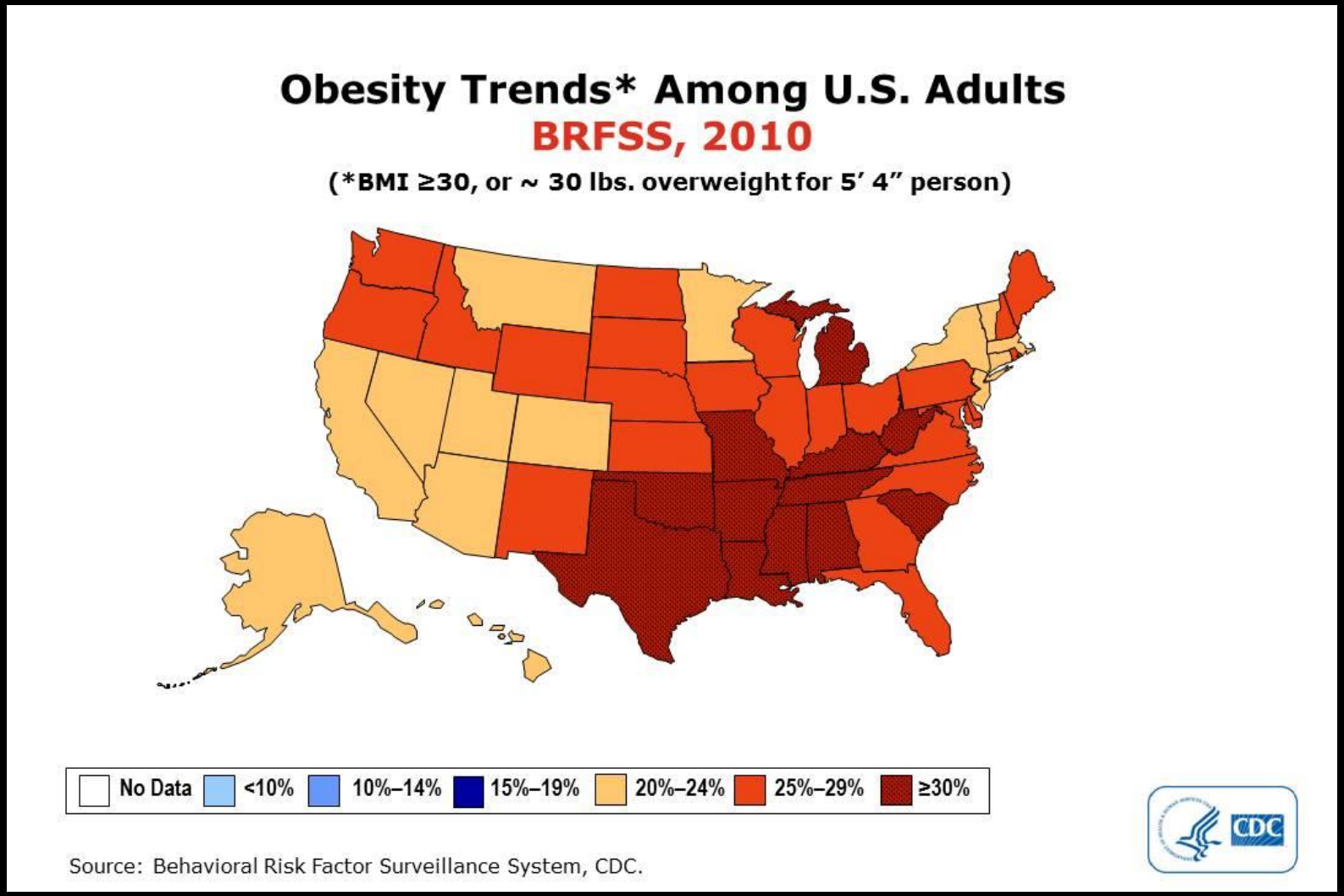
Safe. Comfortable. Convenient.

What are Complete Streets?

Benefit All Users.

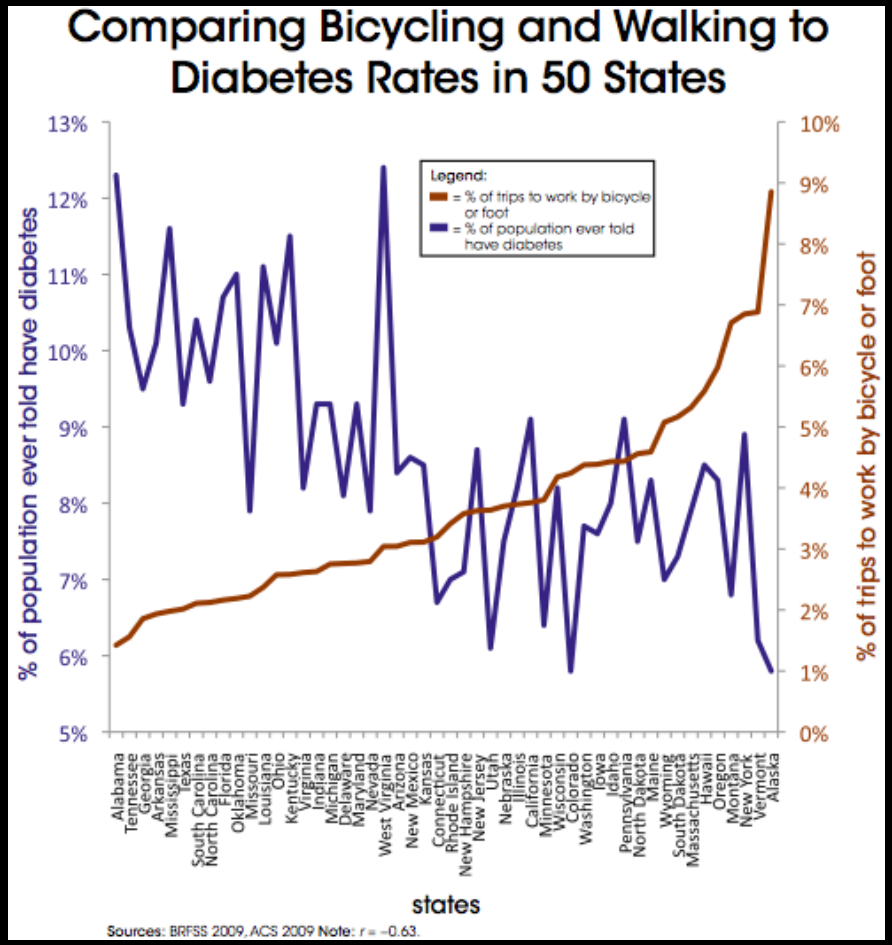

34.9%
of Americans are obese.
57
58
59
Complete Streets

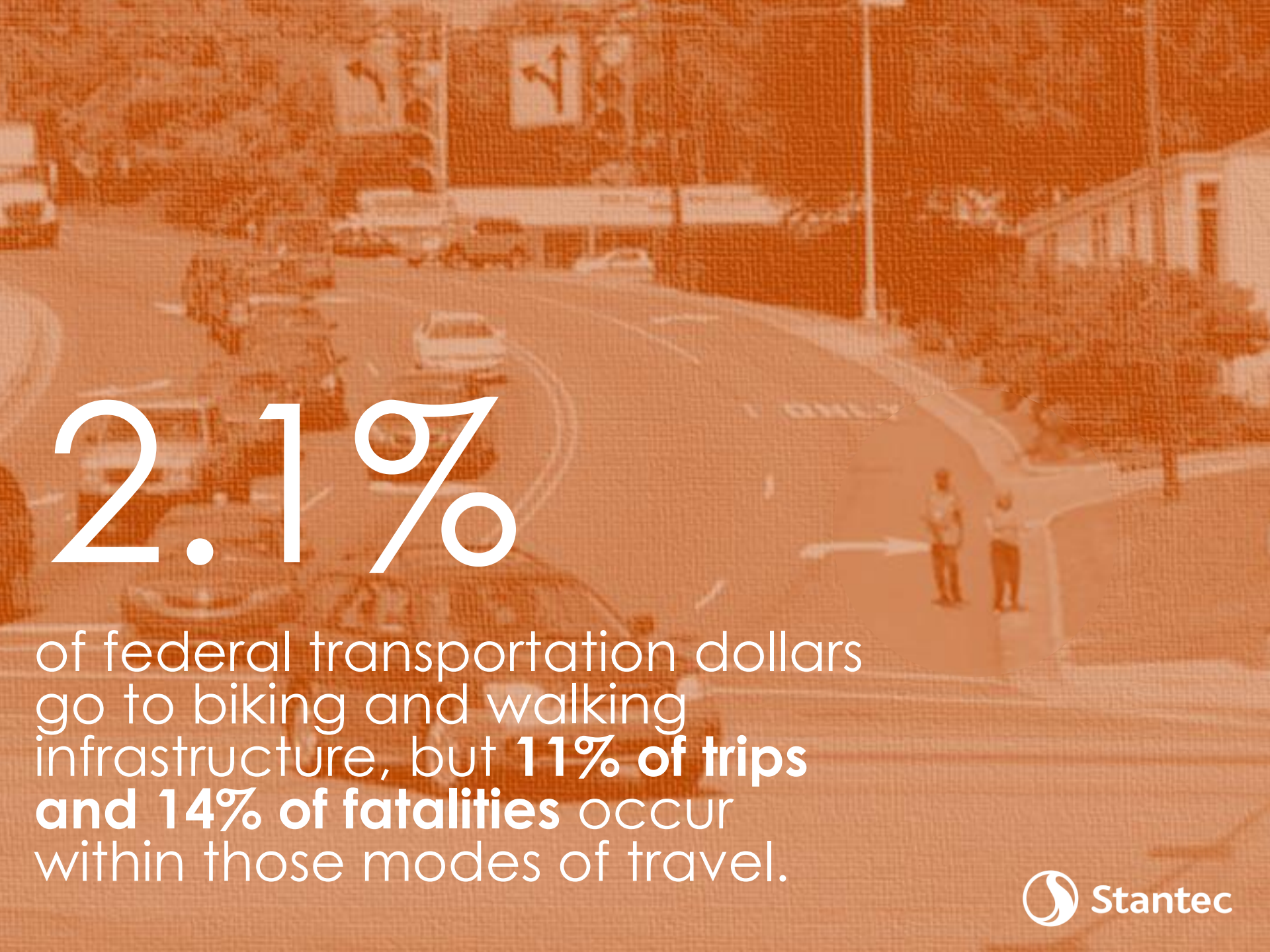
Benefits: Health



Benefits: Health

States with the lowest levels of biking and walking have, on average, the highest rates of obesity, diabetes, and high blood pressure.





2.1%

of federal transportation dollars go to biking and walking infrastructure, but **11% of trips and 14% of fatalities** occur within those modes of travel.

Stantec

Benefits: Safety

There were 32,719 traffic fatalities in the U.S. in 2013. Of these fatalities:

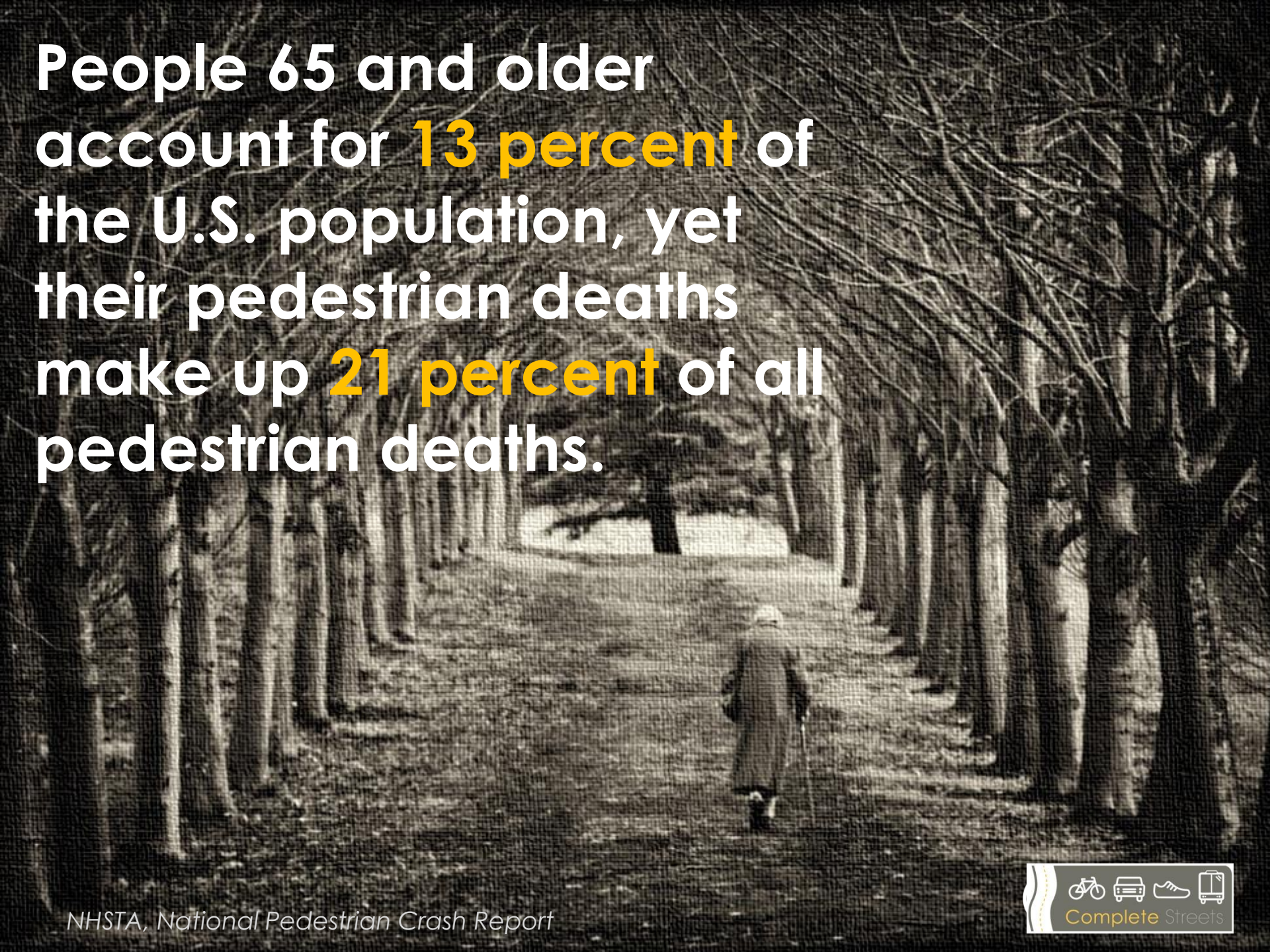
23,303 were people in cars

4,735 were people walking

743 were people on bicycles

National Highway Traffic Safety Administration: Fatality Analysis Reporting System 2014

Complete Streets


People 65 and older account for 13 percent of the U.S. population, yet their pedestrian deaths make up 21 percent of all pedestrian deaths.
NHSTA, National Pedestrian Crash Report
Complete Streets

Benefits: Safety

More than 40% of pedestrian fatalities occur where there is no available crosswalk.

Smart Growth America and National Complete Streets Coalition

Benefits: Economy

"Young people do not want to work in office parks anymore… We're seeing this big change in this country. **It's not political…it's more generational**… This is where we need to think very differently, because if you don't, you will be left behind."

-Mitchell Silver, Past President, APA

Benefits: Economy

Fayetteville Street, Raleigh

$15 million public investment in streetscape improvement 2006

$50 million in private investment in following 5 years

20 new business establishments

$5 million in sales tax annually

Complete Streets

How we do it?

Example: Six Forks Road, Raleigh, NC (Retrofit)

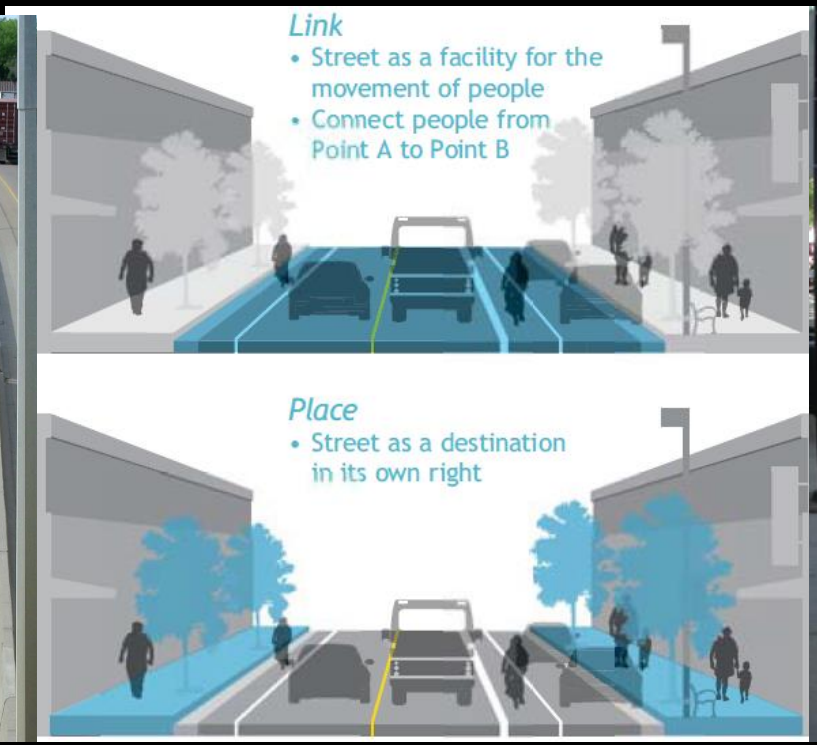

KINK
KINK fm102. (Now, 20% kinkier.)
7035 BUZZ
CASH for GOLD
Jiffy Mart
FAST SERVICE
OPEN
90
90

Complete Streets:

"It's a process, not a product" - MMR

- ✓ Define Success
- ✓ Prioritize Modes
- ✓ Define Design Features/Limitations
- ✓ Make Tradeoffs
- ✓ Design in detail

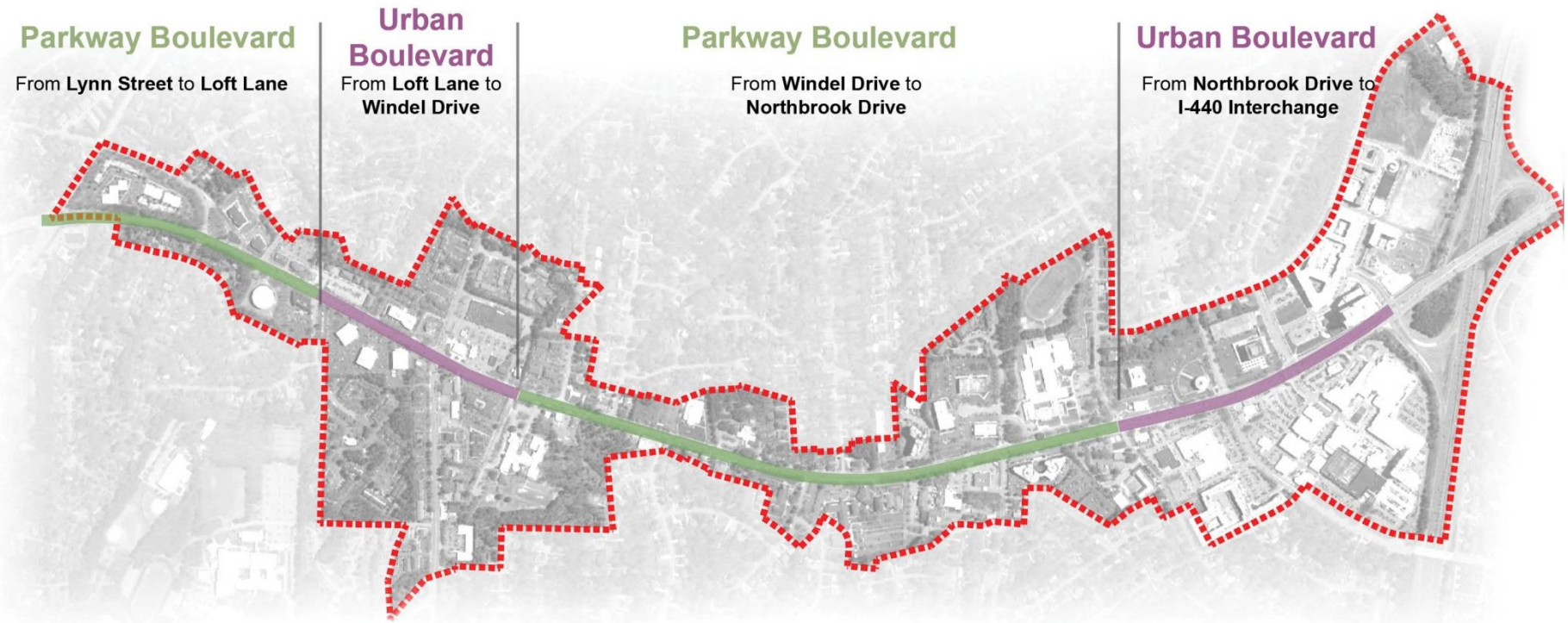
Link and Place



Complete Streets

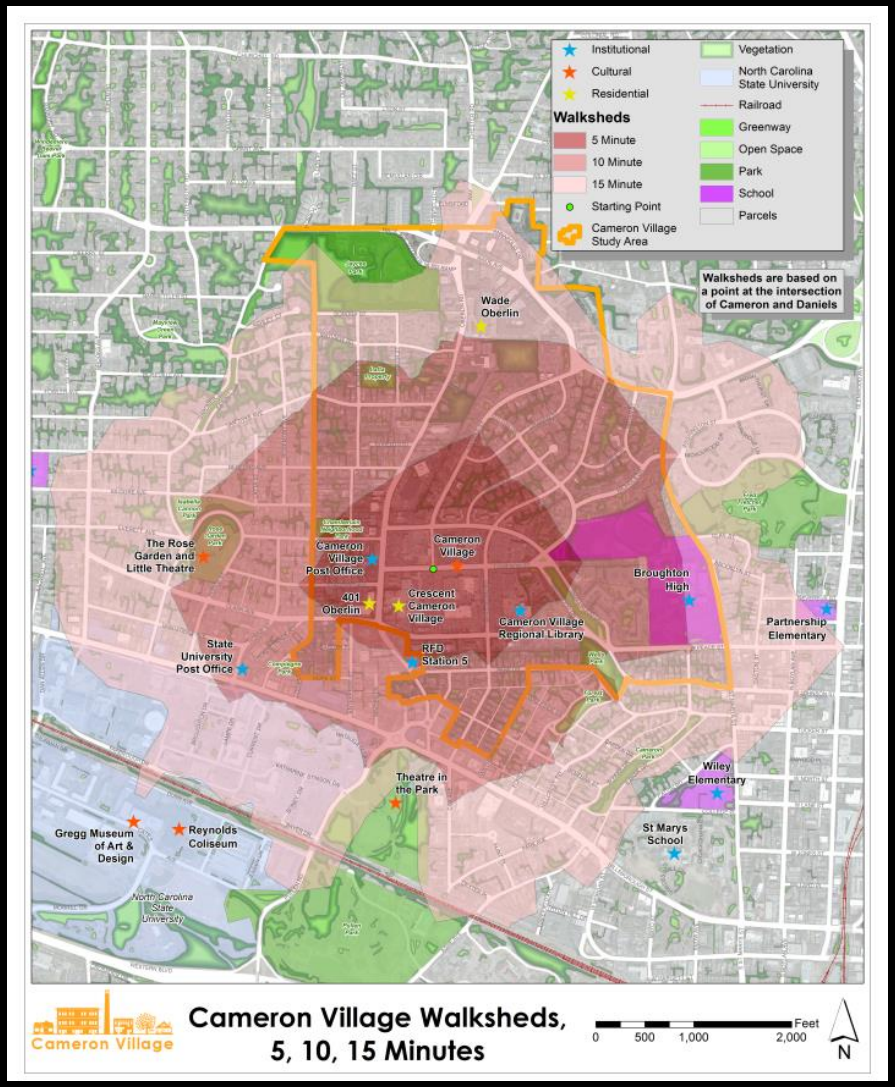
Design Elements

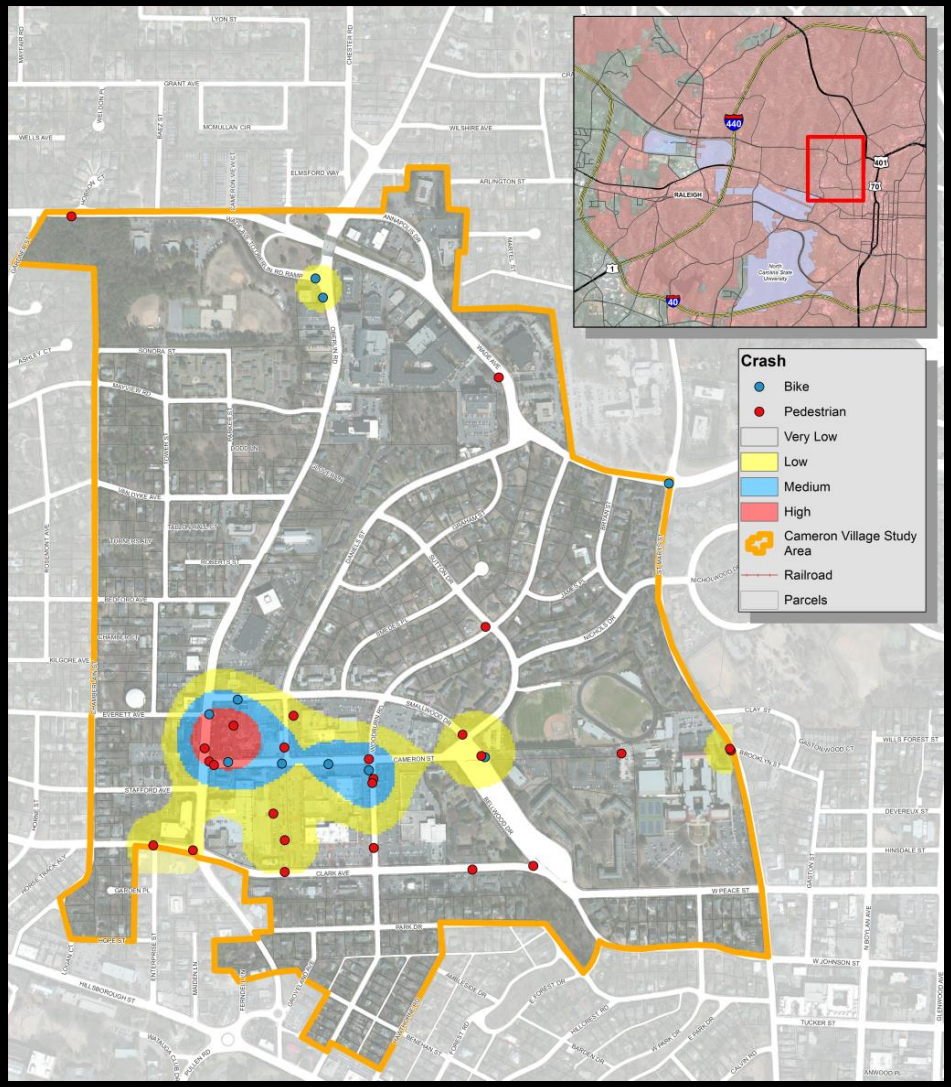
Area Context



Area Context

Walksheds & Bike/Ped Crashes





Lighting

Traffic-Traffic-Traffic!

Six Forks Road & Lynn Road	AM							
	No Build				Build			
Direction	NB Left	SB Left	EB Left	WB Left	NB Left	SB Left	EB Left	WB Left
Volume	93	216	124	113	93	216	124	113
Laneage								
95th Percentile Queue (ft)	117	352	235	173	58	149	158	146
Average Queue (ft)	57	169	111	93	20	82	87	71
Left Turn Lane LOS	F	F	E	E	F	F	E	E
Approach LOS (Through Movements)	E	E	E	E	D	D	E	E
Approach Delay (Turn Movements)	100.8	103.6	68.8	77.4	98.3	87.7	57.2	67.9

Six Forks Road & Lynn Road	PM							
	No Build				Build			
Direction	NB Left	SB Left	EB Left	WB Left	NB Left	SB Left	EB Left	WB Left
Volume	271	339	204	117	271	339	204	117
Laneage								
95th Percentile Queue (ft)	424	808	380	222	202	298	272	123
Average Queue (ft)	217	530	259	115	85	196	159	57
Left Turn Lane LOS	F	F	F	E	F	F	F	D
Approach LOS (Through Movements)	F	F	F	F	E	F	E	F
Approach Delay (Turn Movements)	166.3	143.2	227.4	56.2	83.2	116.5	103.6	44.3

Six Forks Road & Millbrook Road	AM							
	No Build				Build			
Direction	NB Left	SB Left	EB Left	WB Left	NB Left	SB Left	EB Left	WB Left
Volume	149	110	127	153	149	110	127	153
Laneage								
95th Percentile Queue (ft)	302	253	298	486	267	210	252	336
Average Queue (ft)	166	67	157	290	106	52	153	232
Left Turn Lane LOS	F	E	F	F	F	E	F	F
Approach LOS (Through Movements)	D	F	F	F	D	E	F	F
Approach Delay (Turn Movements)	100.2	62.8	129.2	173.4	141.7	66.3	133.8	150

Six Forks Road & Millbrook Road	PM							
	No Build				Build			
Direction	NB Left	SB Left	EB Left	WB Left	NB Left	SB Left	EB Left	WB Left
Volume	135	248	185	246	135	248	185	246
Laneage								
95th Percentile Queue (ft)	271	483	346	560	294	333	341	560
Average Queue (ft)	129	285	228	340	92	181	228	408
Left Turn Lane LOS	F	F	F	F	F	F	F	F
Approach LOS (Through Movements)	F	F	F	F	F	E	F	F
Approach Delay (Turn Movements)	107	273.3	117.3	152.3	95.5	163.2	166.9	132.5

Six Forks Road & Lassiter Mill Road	AM							
	No Build				Build			
Direction	NB Left	SB Left	EB Left	WB Left	NB Left	SB Left	EB Left	WB Left
Volume	164	77	323	19	164	77	323	19
Laneage								
95th Percentile Queue (ft)	180	222	586	50	162	372	1000	53
Average Queue (ft)	85	89	284	18	92	96	568	24
Left Turn Lane LOS	F	F	F	F	F	F	F	F
Approach LOS (Through Movements)	C	F	F	E	B	F	F	E
Approach Delay (Turn Movements)	112.5	122.2	100.3	83.5	101.4	82.7	108.3	85.3

Six Forks Road & Lassiter Mill Road	PM							
	No Build				Build			
Direction	NB Left	SB Left	EB Left	WB Left	NB Left	SB Left	EB Left	WB Left
Volume	352	42	766	49	352	42	766	49
Laneage								
95th Percentile Queue (ft)	250	149	838	124	188	241	835	103
Average Queue (ft)	146	40	825	71	125	38	826	50
Left Turn Lane LOS	F	F	F	F	F	F	F	F
Approach LOS (Through Movements)	F	F	F	F	E	F	F	F
Approach Delay (Turn Movements)	161.1	90.7	355.7	115.6	136.7	99.3	164	113.2

Future Year 2035 Left-Turn Performance

Lynn ⮥ Millbrook ⮥ Lassiter Mill ⮥

Preliminary Six Forks Corridor Average and 95th Percentile Left-Turn Lane Queuing

2035 Average Queuing Length

2035 95th Percentile Queuing Length

AM / PM Future Year 2035 Overall Intersection Level of Service

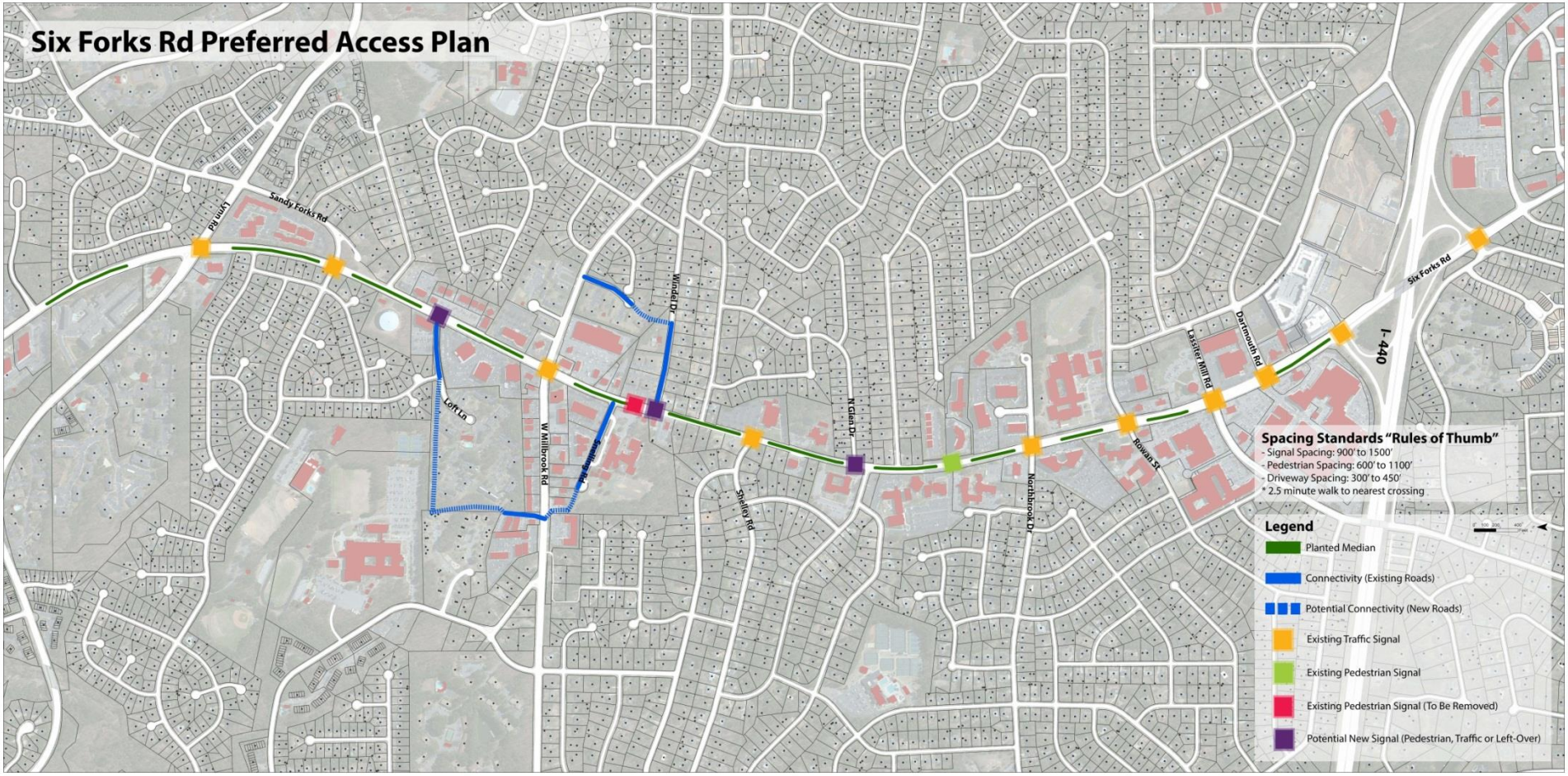
Raleigh Roads

Building Footprints

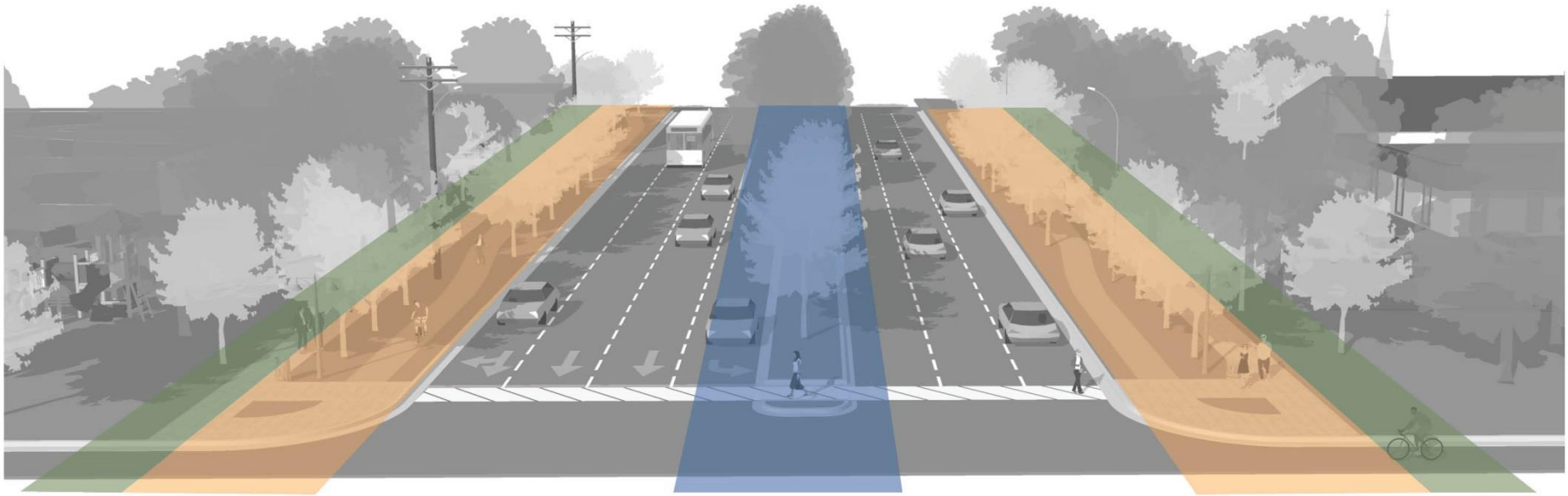
Updated on: 11/20/2014

0 450 900 1,800 Feet

How does it all work together?



Corridor Transition

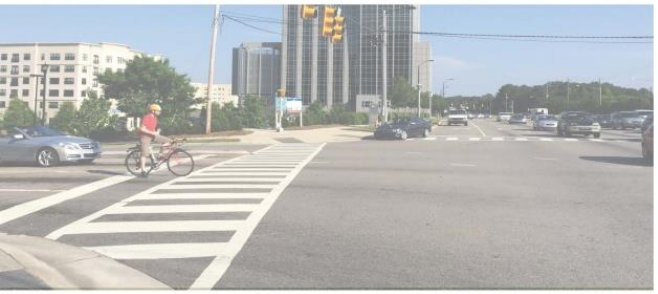


Corridor Cross Section

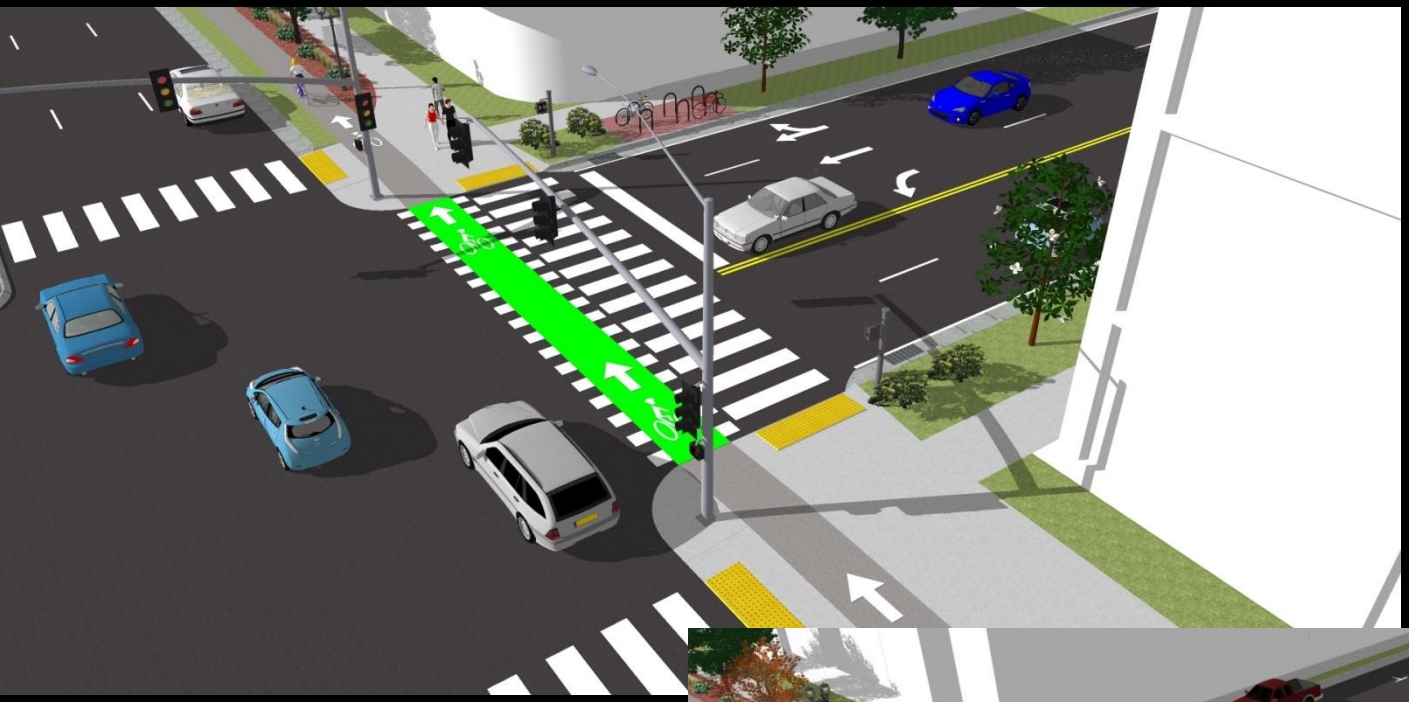
EDGE TRANSITION ZONE		SIDEWALK ZONE		BIKE ZONE	TRAFFIC ZONE	MEDIAN ZONE	TRAFFIC ZONE	BIKE ZONE	SIDEWALK ZONE		EDGE TRANSITION ZONE
6' Minimum Planted Buffer and/or Pavement Extension		6' Sidewalk	6' Planting Buffer	5' Bike Lane with 3' Planted Buffer Strip	2.5' Curb Three 11' Wide Travel Lanes 1.5' Curb	11' Median and 11' Turn Lane Zone Optional Pedestrian Refuge Island	1.5' Curb Three 11' Wide Travel Lanes 2.5' Curb	5' Bike Lane with 3' Planted Buffer Strip	6' Planting Buffer	6' Sidewalk	6' Minimum Planted Buffer and/or Pavement Extension

125' -135' ROW

Bicycle/Pedestrian



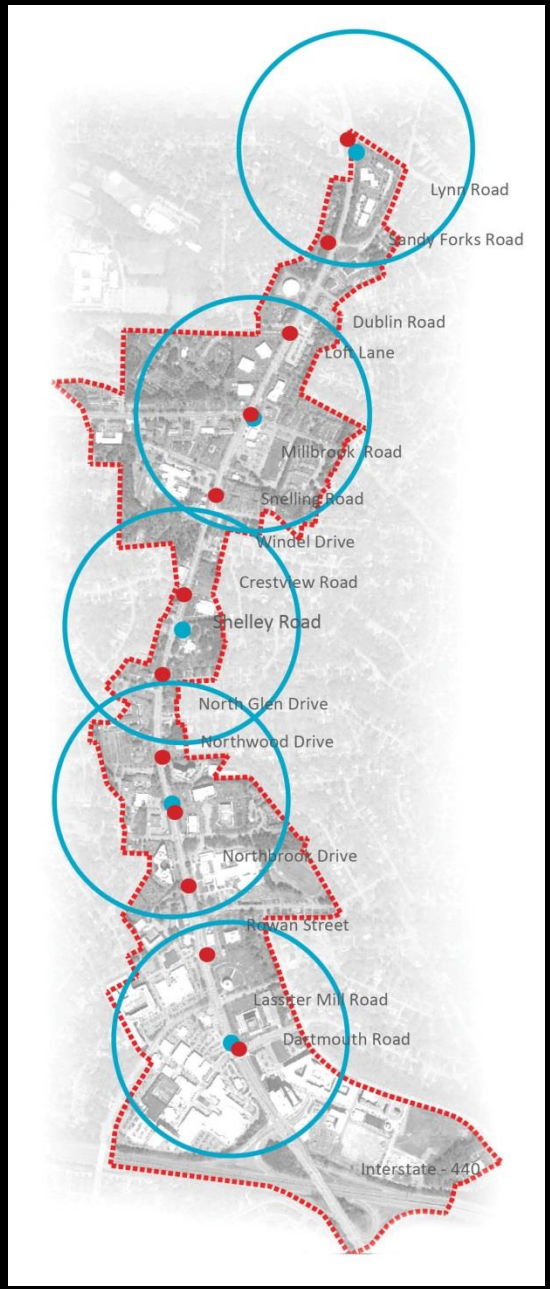
Intersection Treatments



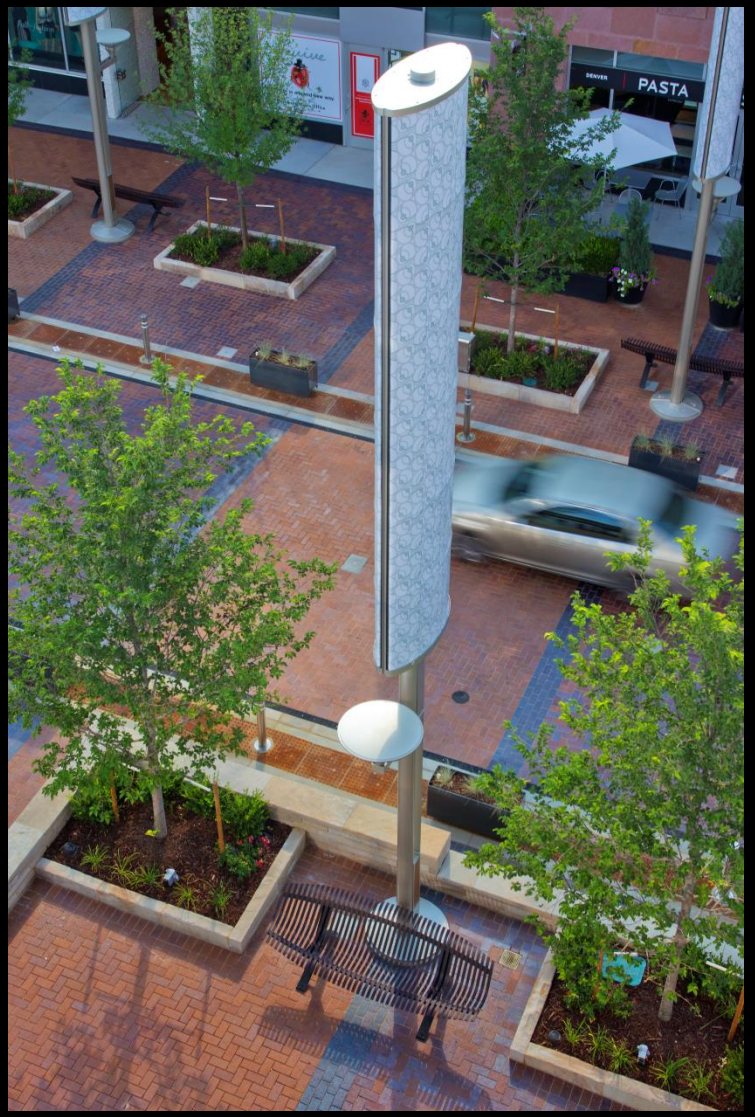
Major Intersections

Minor Cross Streets

High Priority Transit Corridor



Furnishings, Public Art, Streetscape



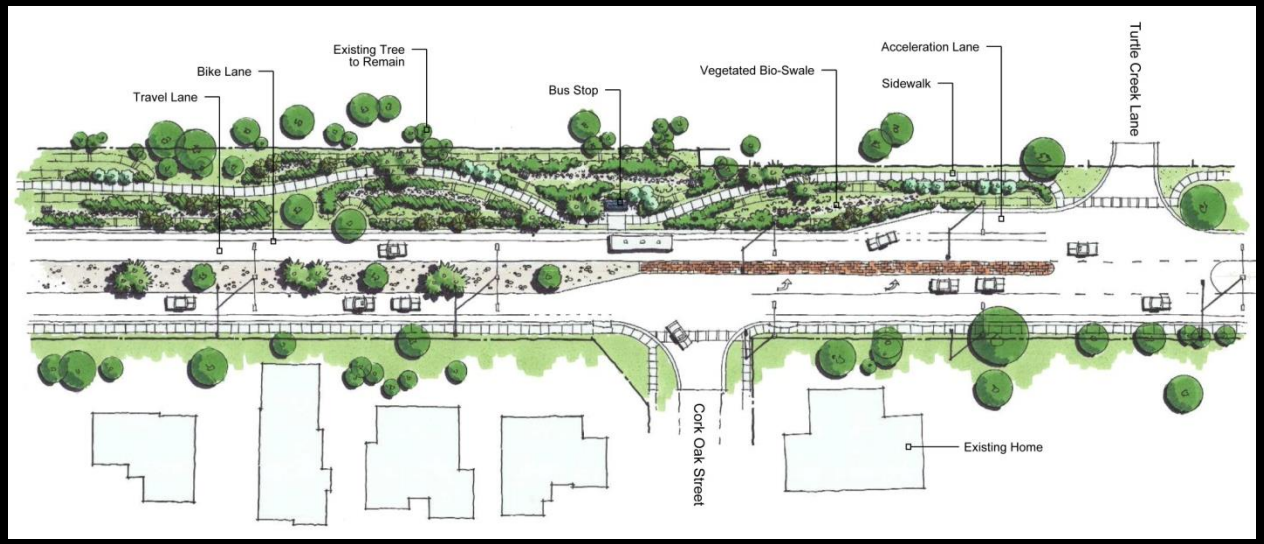
LID & Stormwater BMPs

Example: Honore Avenue, Sarasota, FL (2013)

- Two-Lane vs. Four-Lane
- Limited ROW
- Needed better connections to school and parks
- What to do with the water?
- Save the Trees!

Context-sensitive design saves mature trees and enhances aesthetics.

The Idea Behind Stormwater



Tradeoff Benefits

- Context-sensitive design and low impact development (LID) strategies reduced floodplain impacts by 23.2 acre-feet
- Saved 1000 mature trees
- Buffered ped/bike facilities with connections to school/parks

Reduced Floodplain Compensation Area

Design in Detail

Measuring Success

- **3X the area for bikes, pedestrians and streetscape**
- Consistent lanes, with only a 26% increase in asphalt roadway paving
- 10 new high quality bus shelters
- **52 high visibility crosswalks**
- Over 4 miles of grade separated bike lanes
- Over 4 miles of new wider sidewalks
- **Almost 8 million gallons of water quality treatment**
- Locations for over 700 canopy and flowering trees
- Over 3 acres of planted medians
- Plans for 10 neighborhood gateway
- **Measurable increase in LOS for cars, bikes, pedestrian and transit**

Complete Streets

Nothing like a great example!

Route 9A – West Side Manhattan

Calgary Cycle Track

CS Design Guidelines

Complete Retrofit

- Elevated freeway
- Transformed into an active Complete Street Boulevard

The Original West Side Highway

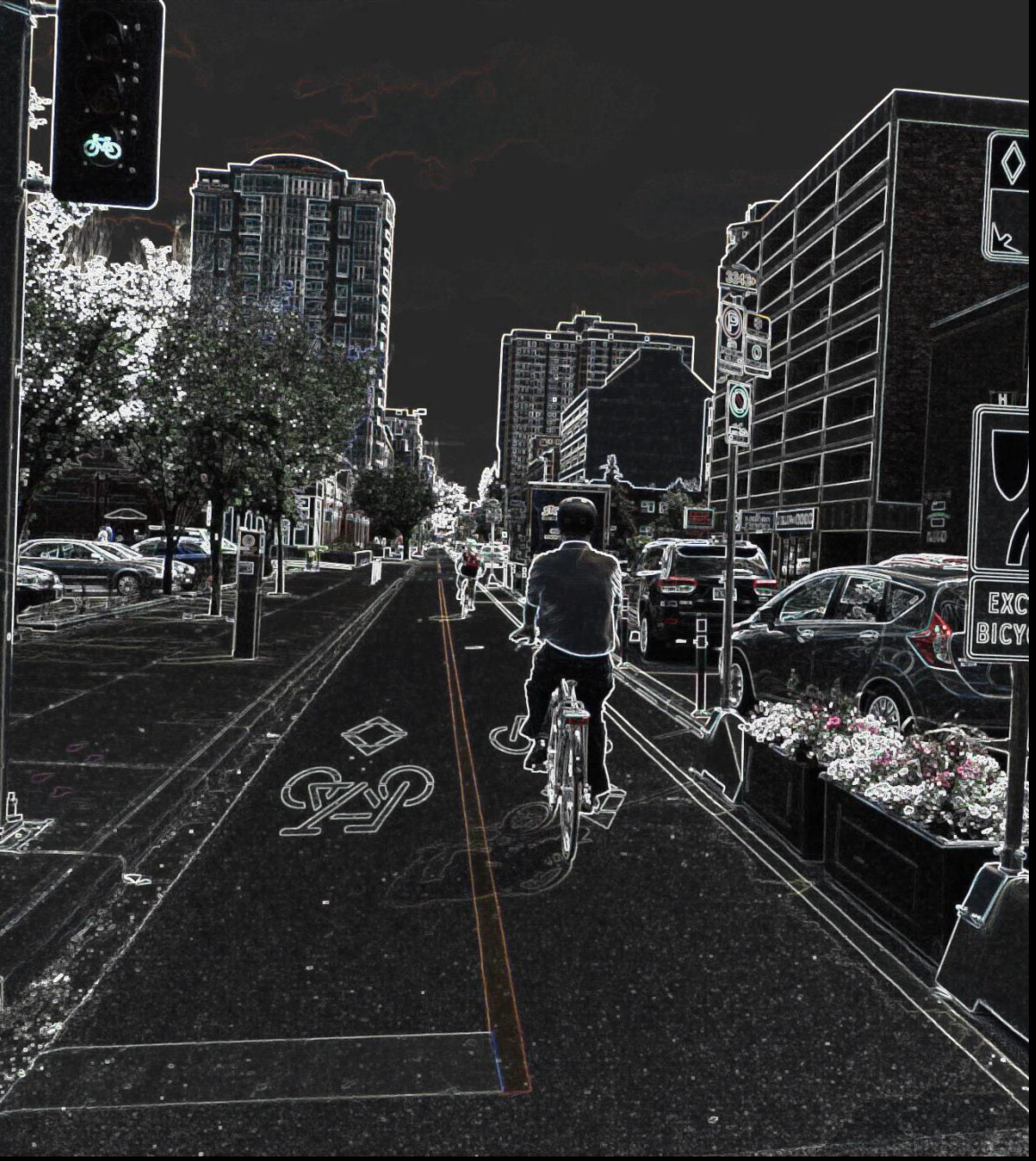

9A


Post Highway Collapse


At-grade interim solution

The Boulevard Concept circa 1996…
Today's Complete Street

West Side Highway Southern Terminus



Calgary Cycle Track

- 1.5 year pilot project
- $ 5.5M capital cost
- 2 years from award of planning study to opening of the network


N
Memorial Dr NW
Bow River
Memorial Dr NE
Bow River
Riverfront Ave SE
7 St NW
10 St NW
9A St NW
Edmonton Trail NE
4 St NE
5 Ave SE
3 Ave SW
4 Ave SW
5 Ave SW
2 St SW
1 St SW
3 St SW
Centre St S
4 Ave SE
6 Ave SE
4 St SE
9 St SW
8 St SW
7 St SW
9 Ave SW
10 Ave SW
11 Ave SW
14 St SW
10 Ave SE
12 Ave
15 Ave SW
17 Ave SW
4 St SW
Macleod Trail SE
Elbow River
1
2
3
4
3
LEGEND
1 New cycle track on 5 Street SW
2 New cycle track on 12 Avenue
3 New cycle track on 8/9 Avenue
4 Shared space on Stephen Avenue
Existing cycle track
Existing supporting bikeway
Potential supporting bikeway
Regional pathway
C-train

80

Presentations in one year to plan the network with stakeholders

6.5

kilometers of bike infrastructure designed and constructed to create a network in the downtown core

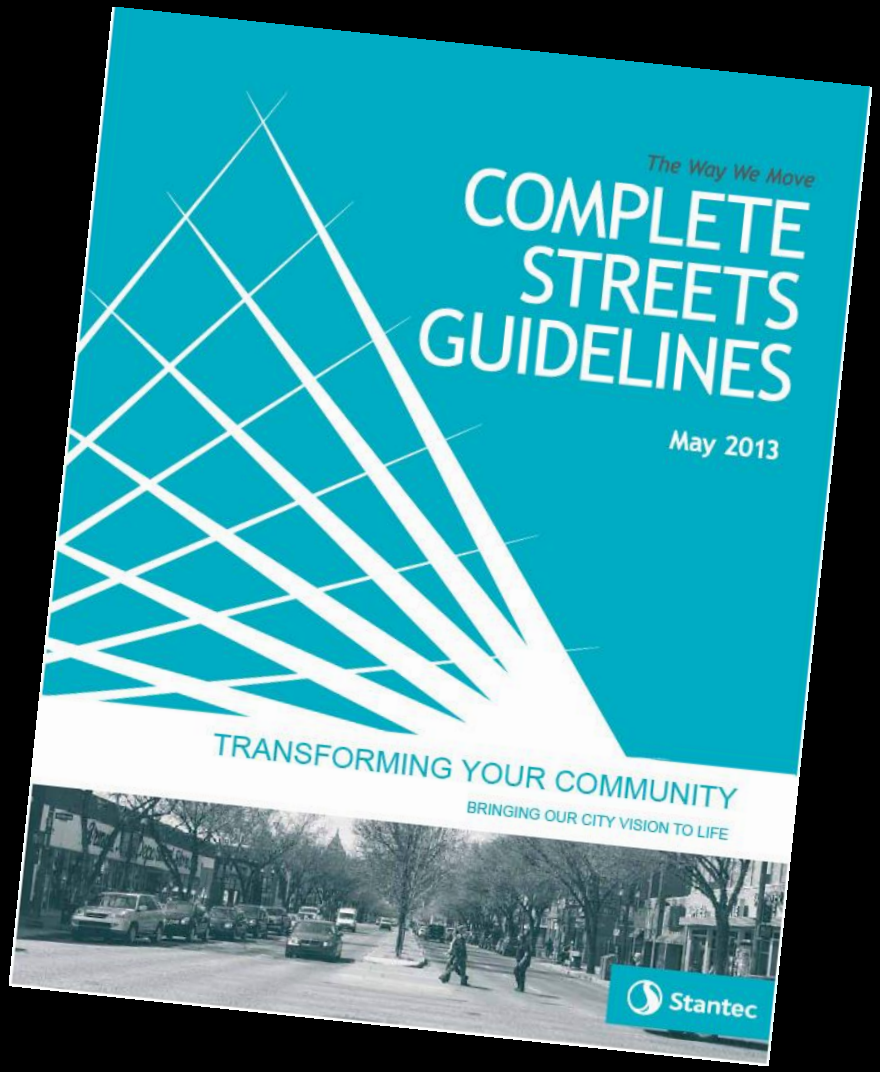
Three different bicycle treatments to create a network using four downtown streets

Two-way cycle track on a Two-way street

One-way cycle tracks on a Two-way street

Integration of slow moving bicycles on a pedestrian street

Edmonton Complete Streets Guidelines



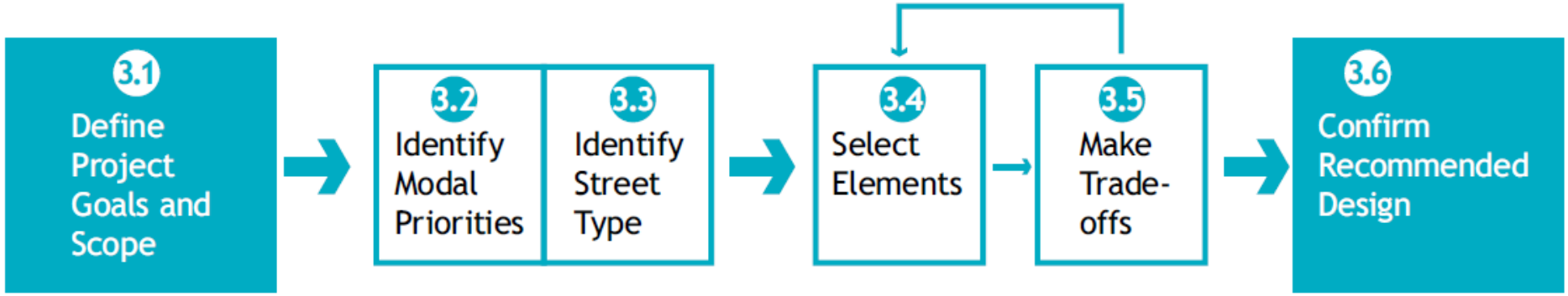
Complete Street Process

Alignment with Complete Streets Principles

Broad Parameters

Specifics

Final Check Back



Process Flowchart

Edmonton Complete Streets Guidelines

Evidence-based design tailored to local conditions

Element Description

Application Context

Cross-sections

4.3.6 Cycle Tracks

Description

A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a bike lane. A cycle track is physically protected from motor vehicle traffic and distinct from the sidewalk. Protection methods include on-street parking, raised median curbs, or a raised [illegible] surface.

By separating bicyclists from motor vehicle traffic and pedestrians, cycle tracks can offer a higher level of comfort than ***Bike Lanes*** or ***Shared Use Paths*** and are attractive to a wide range of the public.

Application Context: Land Use, Street Type and Orientation

- City wide bike routes on the **Bike Network**
- This facility type is most likely to be installed on **Arterial** streets with high motor vehicle volumes and speeds.
- On **Transit Network** streets consider integration with bus stops. See **Transit Integration with Cycle Tracks**

Bikeway facility selection should be based on an analysis of roadway volumes and speed and other local characteristics.

Best on Roadways with:

- > 10,000 vehicles/day[1]
- >50km/h speed limit
- Frequently congested roadways
- High Truck Volume streets
- High Transit volumes
- Extra available roadway width
- Best on the left side of a one-way road

Driveway and Intersection Crossings

Crossings of driveways and intersections are a challenge for cycle track design. Strategies to mitigate potential crossing conflicts include:

- Reduce the density of driveways and simplify movements through access management.
- Prohibit parking 10-15 m in advance of the crossing.
- Sidewalk furnishings should accommodate a sight triangle of 3.0 - 6.0 m from a crossing.
- Colored pavement and yield signs should be used to identify the conflict areas.

Design Details and Dimensions

Cycle tracks generally require wider dimensions than ***Bike Lanes***, to provide a higher level of comfort and separation, to permit bicyclists to pass one another. Consider the placement of utilities when designing bike facilities with physical separation and the access to fire hydrants.

One-Way Cycle track through zone:

- Standard width: 2.1[2] m

Cycle track buffer zone:

- Standard adjacent to parking: 1.0 m
- Standard adjacent to travel lane: 0.5 m (1.0 m preferred for snow storage).

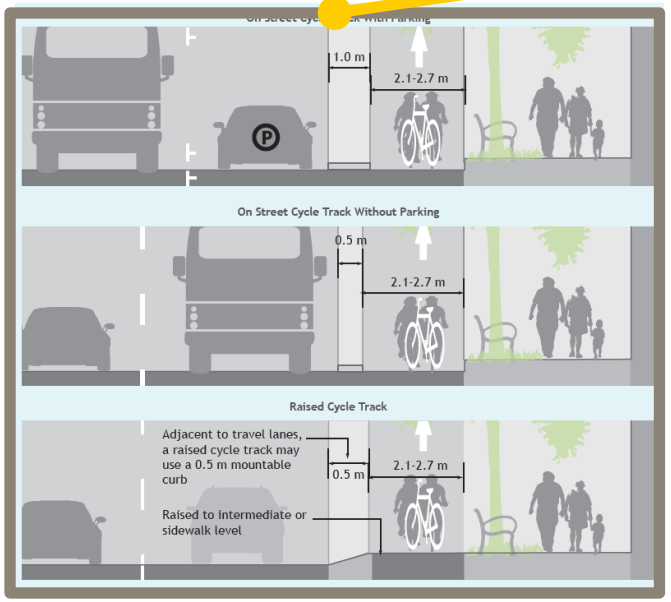
Two-Way Cycle Track:

Application best on one way streets. This is similar to a ***Shared-Use Path Adjacent to Roadways***. See the NACTO Urban Bikeway Design Guide for details.

Two-way cycle tracks function best on the left side of one-way streets.

Raised Median Curb Protection

- Consider bicycle compatible curb profiles to minimize conflict with pedals and maximize ridable surface.



Snow Removal and Maintenance Considerations

City of Edmonton practices for snow removal on bike facilities are currently being reviewed. On cycle tracks the expectation is that snow windrows will be cleared away and [illegible] remain on the cycle track.[1]

References

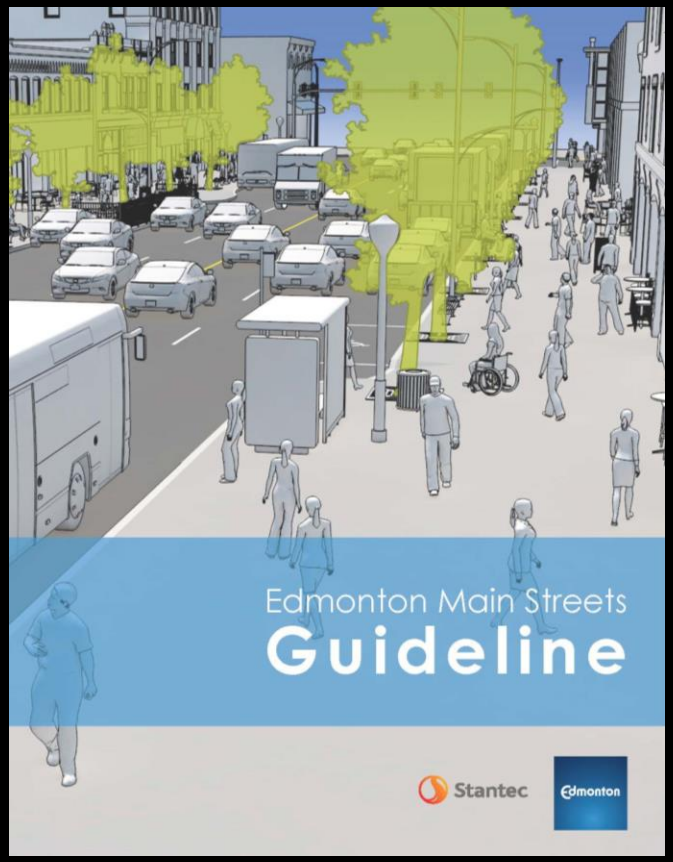
Bikeway Traffic Control Guidelines for Canada, 2nd Ed. Transportation Association of Canada. February 2012.

Urban Bikeway Design [illegible] National Association of City Transportation Officials. Sept[illegible] 2012. Bicycle Boulevard Planning and Design Handbook.

Design Considerations/Details

Operational Considerations

References



Edmonton Main Streets
Guideline

Addition to the 2013 Complete Streets Guidelines (by Stantec)

Outlines:

- Design Parameters for Main Streets
- Design Process
- Guidelines for Requirements for Main Street Design Elements

Definition of Design Zones

MAIN STREET DESIGN ZONES

- Main Streets *have narrow lane widths* that encourage lower vehicle speeds and create pedestrian oriented places while supporting transit service.
- Main Streets design *does not increase the amount of public right of way allocated to the Travelled Way.*
- Main Streets are differentiated through the *provision of an Ancillary Zone* which is flexible space used to support the activity of the adjacent lands and helps create great people places.
- Main Streets are *designed, constructed, maintained, and renewed to an enhanced standard* to support the Main Streets Principles in all seasons.

2.2 MAIN STREET DESIGN ZONES

The Main Street right of way is divided into six design zones that provide different functionality for people accessing, spending time, and travelling through Main Streets. The following defines each Main Street Design Zone.

2.1.1 Adjacent Lands

This space provides active land uses such as ground floor retail and food and beverage establishments that attract people to Edmonton's Main Streets and generate pedestrian activity.

2.1.2 Frontage Zone

Adjacent to the building, this space is used as a support and/or extension of the active land uses along Edmonton's Main Streets. Uses can include ground floor retail displays, café seating, temporary signage, lineup areas, and other activities to support active use of the street by people and businesses.

2.1.3 Pedestrian Through Zone

This space provides an area for pedestrian mobility for people of all ages and abilities to access the various pedestrian oriented destinations along and around Edmonton's Main Streets.

2.1.4 Furnishing Zone

This space provides an area for signs, light and signal poles, street trees, transit stops, and benches in addition to underground utilities to support Edmonton's Main Streets as destinations and people places.

2.1.5 Ancillary Zone

Located between the travelled way and the furnishing zone, this space provides the opportunity for various permanent and temporary pedestrian oriented uses depending on the context and characteristics of the Main Street. The use of this flexible space can vary between blocks and along an individual block. Uses can include parklets, patios, motor vehicle or bicycle parking, loading zones, accessible parking, curb extensions, transit stops, and taxi stands.

2.1.6 Travelled Way

This space provides an area for travelling through a Main Street area or to access Main Street destinations for people travelling by automobile and transit, and for the delivery of goods. In non-peak hours, some of this space may be used as an area for parking and loading and can also be closed at times to motor vehicles to host events and festivals.

Final Thoughts…

- It's a process, not a product
- Context Defined
- Prioritize modes
- There's always tradeoffs
- Intersection Design Exceptions
- Available Design Guidelines
- Measure your success!

Complete Streets Leaders

Thank You!

http://www.smartgrowthamerica.org/complete-streets

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919-277-3106