

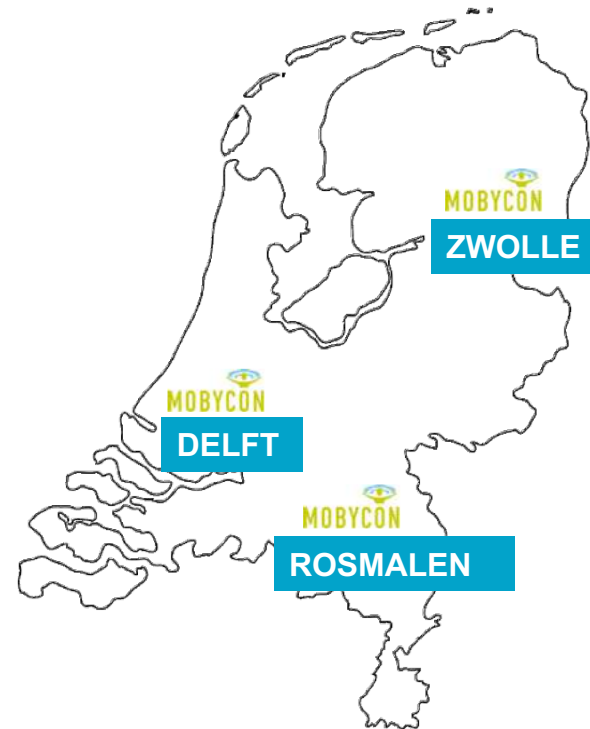
# INTRODUCTION TO DUTCH TRANSPORT PLANNING

CHAPEL HILL, NC

## NORTH AMERICA



## THE NETHERLANDS





#### **BICYCLE PLANNING**

- Master plans and network design
- Customized design manuals
- Facility design and design review
- Policy and planning master classes



#### **PUBLIC TRANSPORT**



#### **PUBLIC SPACE**

- Design and redesign of complete streets and Shared Space
- streetscapes



#### **MOBILITY MANAGEMENT/ TRAVEL DEMAND MANAGEMENT**

- Travel plans
- Municipal mobility scans
- Smart working scans



#### **TRAFFIC SAFETY**

- Design of infrastructure
- Road safety and collision analysis
- Educational programs



#### **PARKING**

- Surveys
- Parking policies
- Facility design



#### **EDUCATION**

- Lectures and workshops for planners and engineers
- Traffic safety curriculum for school children
- Bicycle skills courses and training for bicycle trainers



#### **STUDY TOURS**

- Customized study tours to The Netherlands
- Peer exchanges with Dutch engineers and planners



We help the world be  
less dependent on the  
car





# Mobycon Training Team



**Johan Diepens**

Founder and CEO,

Mobycon

Delft, The Netherlands

[MOBYCON.COM](https://mobycon.com)

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Senior Consultant

North America

Mobycon

Durham, NC



**Justin  
Goulding**

Consultant

North America

Mobycon

Ottawa, Canada

## Round Table Introductions

- Who are you?
- Where are you from (organization/municipality)?
- Why did you decide to attend this training session?



## LIVING STREETS Assignment

Three intersections

With regards to safety:

- List THREE elements of the design you feel are strong
- List THREE elements of the design you feel need to be improved

## Intersection #1





## Intersection #1



## Intersection #2





## Intersection #2



## Intersection #3



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## Intersection #3



# Welcome to The Netherlands





How many people have been to NL?



# Content

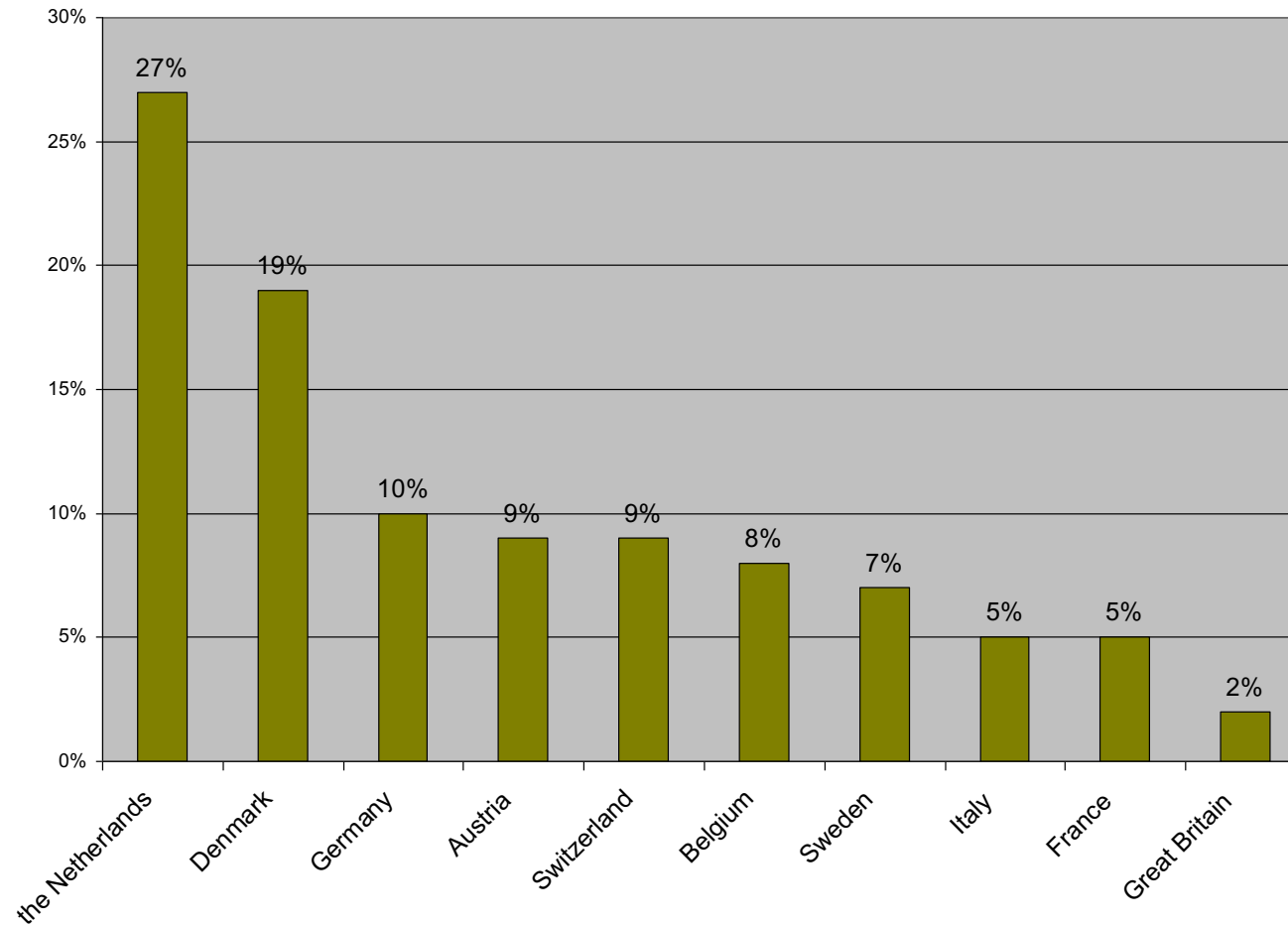
- The basics
- Network planning in The Netherlands
- Design outcomes



## Living Streets Lab – Objectives

- Learn about the Dutch approach to integrated mobility and explore current trends in designing living streets
- Review the key questions to ask when designing for all road users
- See how protected intersections work and see how these design concepts could be applied outside the Netherlands

# Bicycle Modal Share



## Trends in Bicycle Modal Share

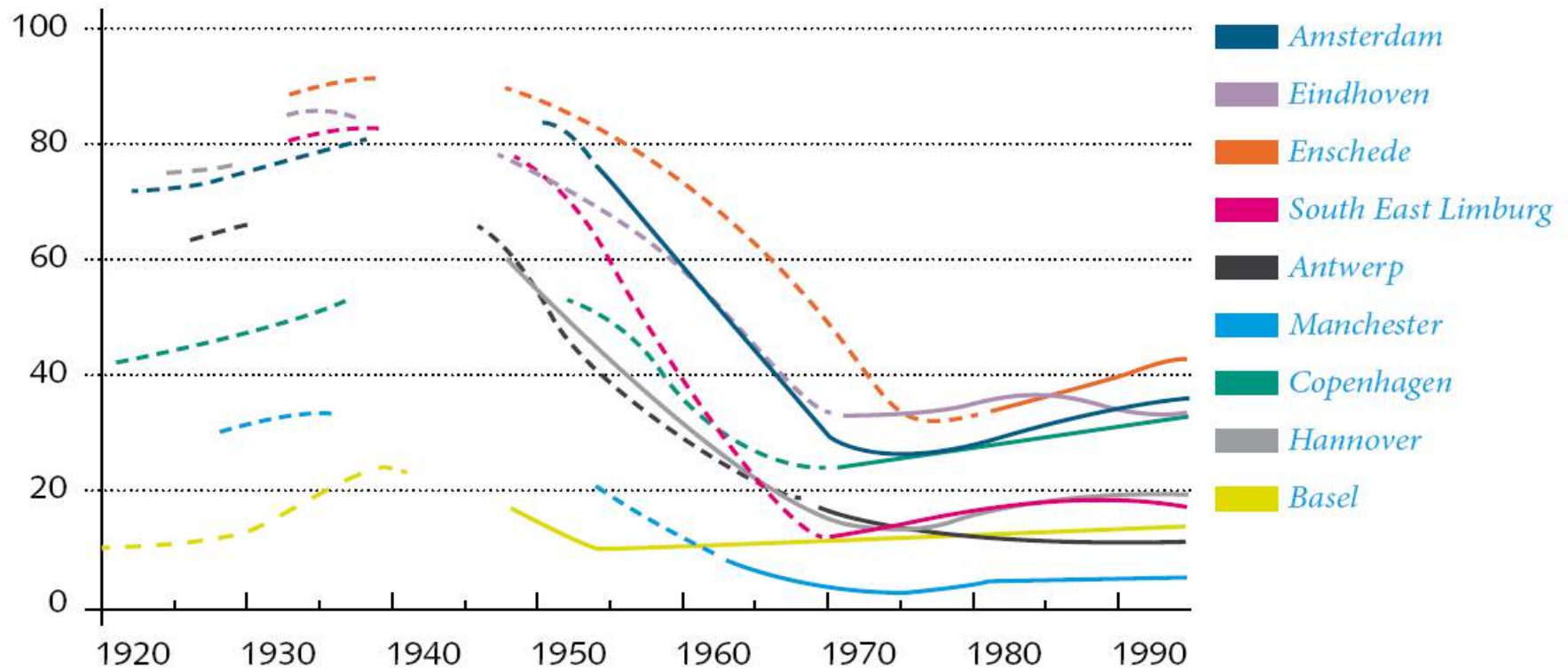


Figure 5: Historical development in bicycle share in 9 European cities Source: A.A. Albert de la Bruheze and F.C.A. Vervaart. Bicycle traffic in practice and policy in the twentieth century, 1999









## STREETS OF AMSTERDAM



## BIKE PARKING IN AMSTERDAM







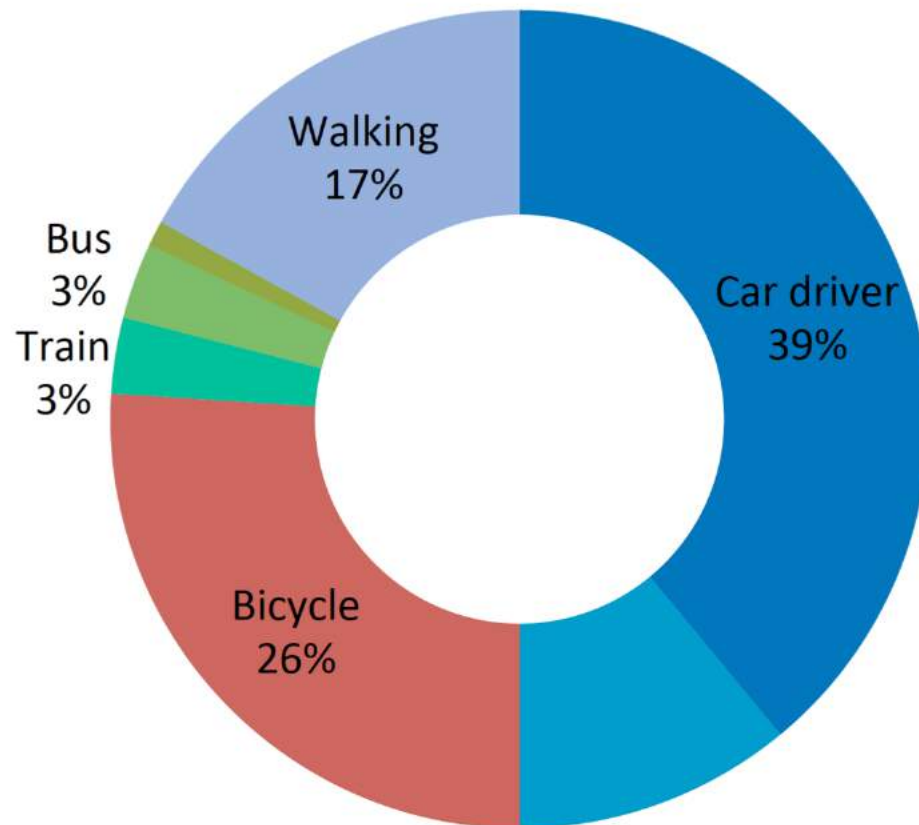
## How did we get there?

- Oil crisis in the 70's
- "Stop de Kindermoord"

## Some numbers

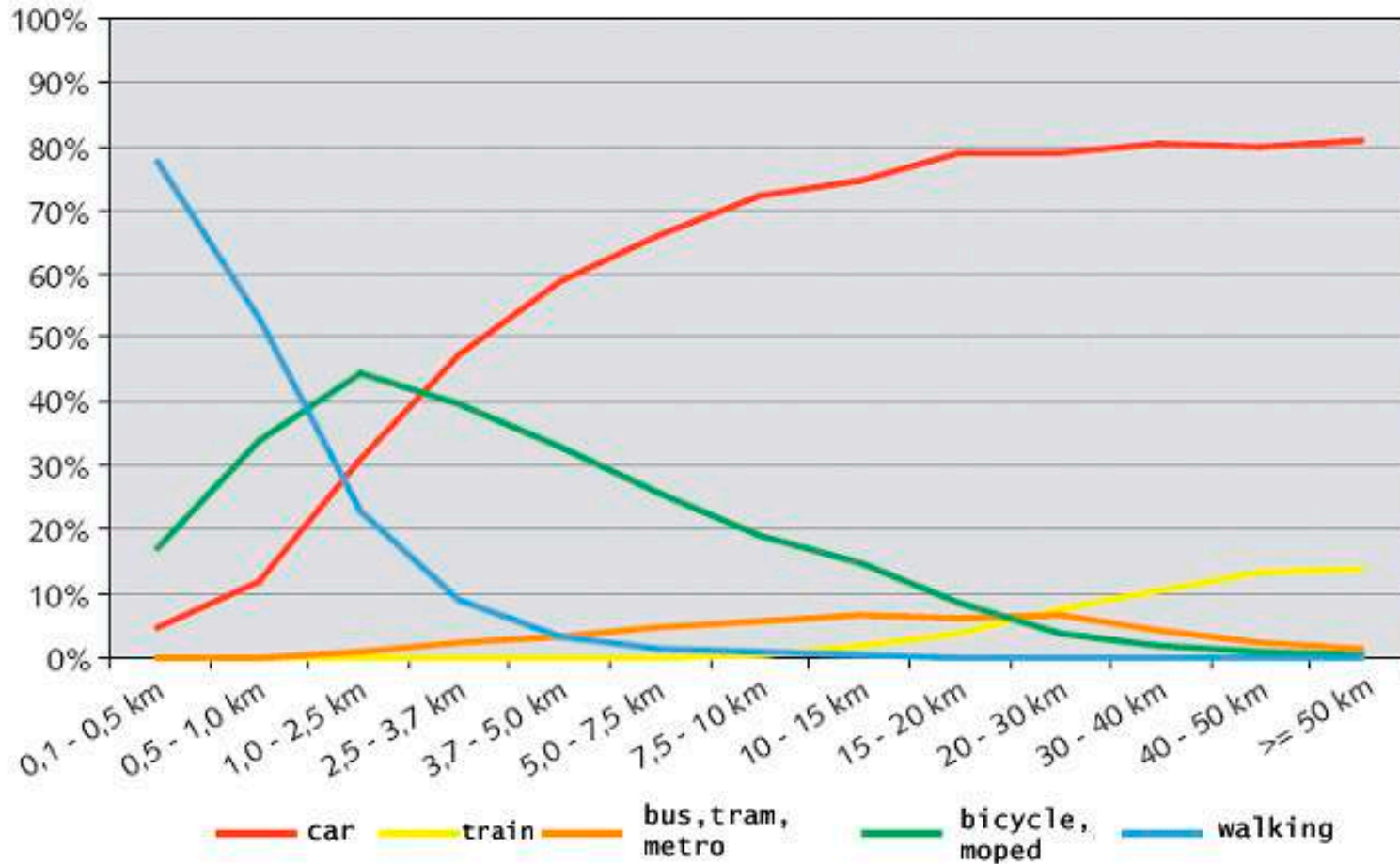
- Netherlands, high car density/km<sup>2</sup>
- On average 3.2 trips per day:
  - 1 trip car driver
  - 0.8 trip bicycle
  - 0.6 trip walking
  - 0.5 trip car passenger
  - 0.2 trip public transport
  - 0.1 trip other
- In Top-5 most road-safe countries

## Some numbers





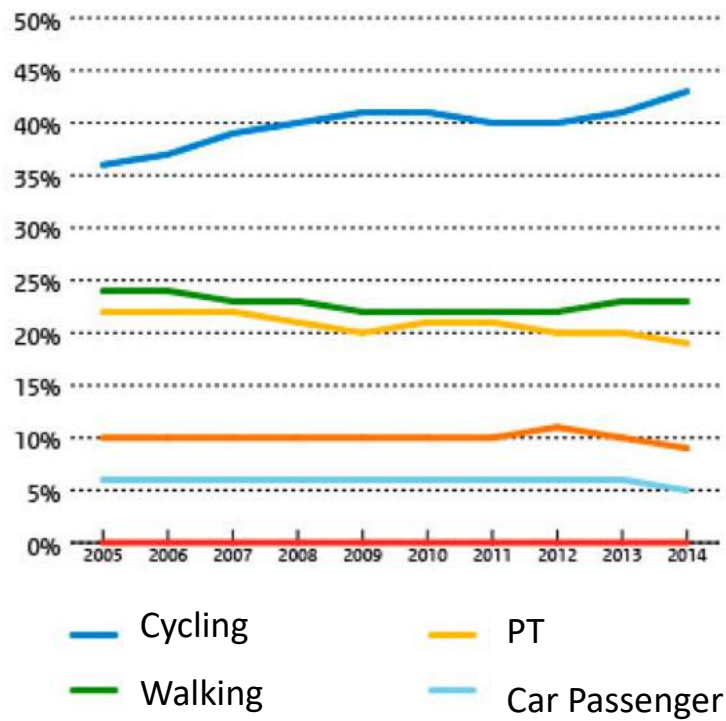
## Mode share by distance



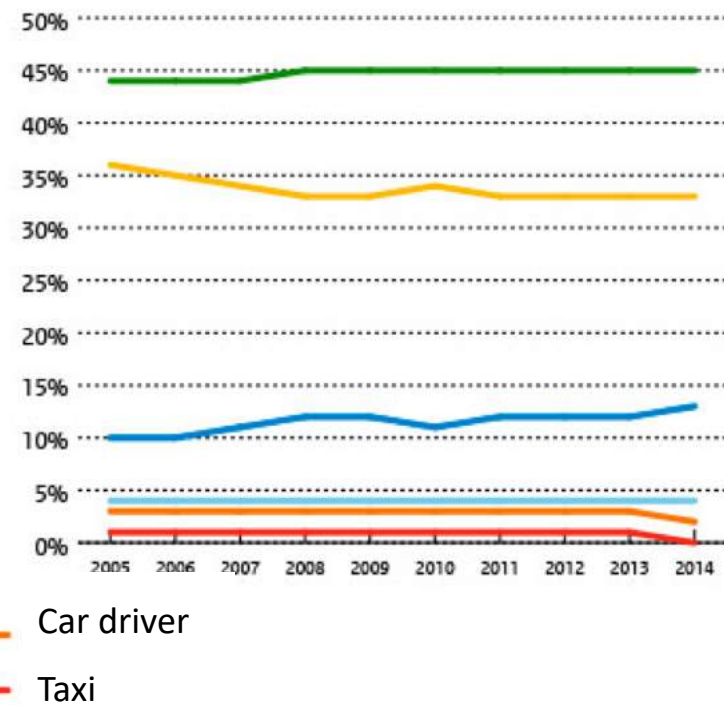
Source: RWS/AVV 2005 / MON 2005

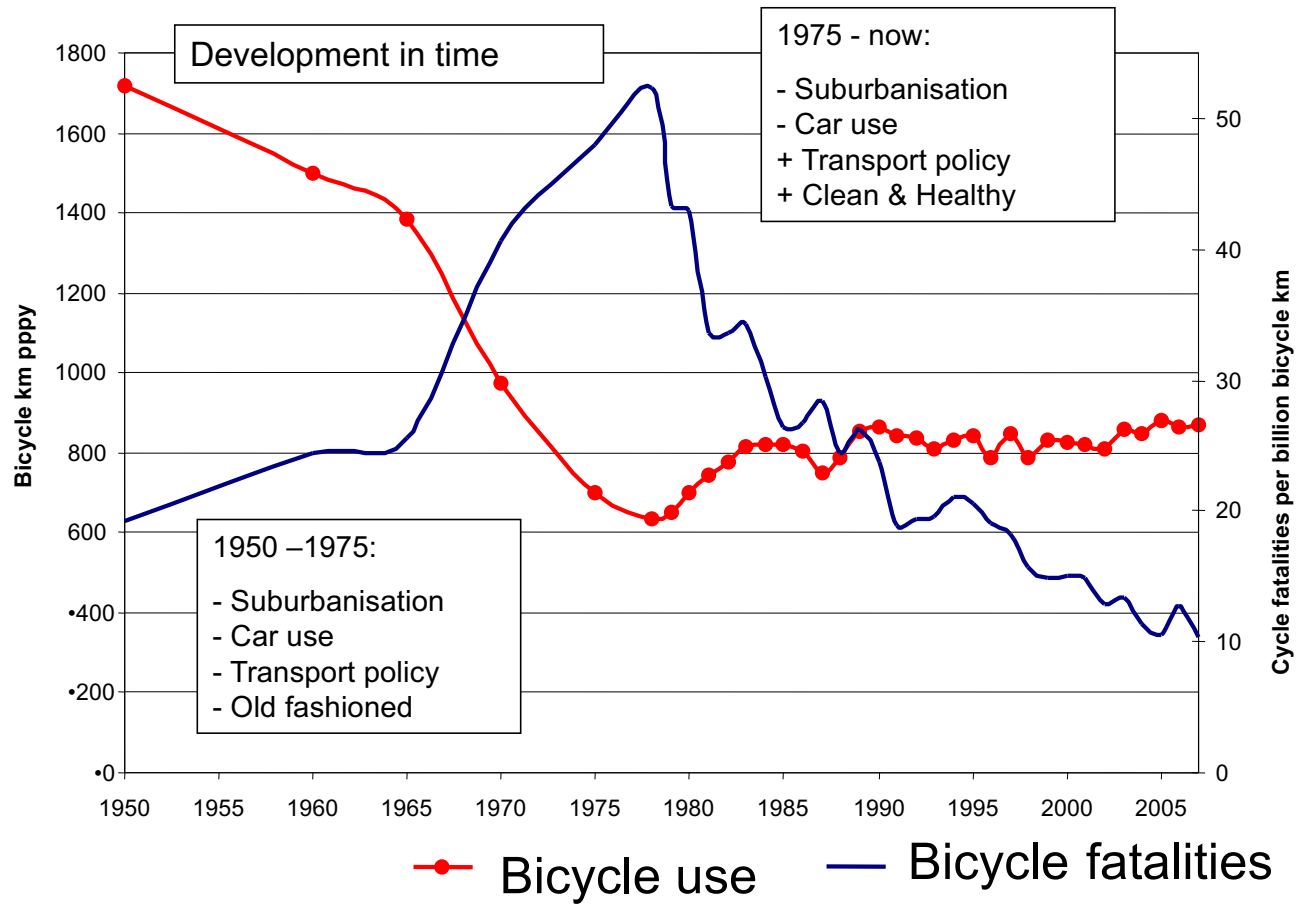
# FOCUS ON TRIP CHAINING

To the station



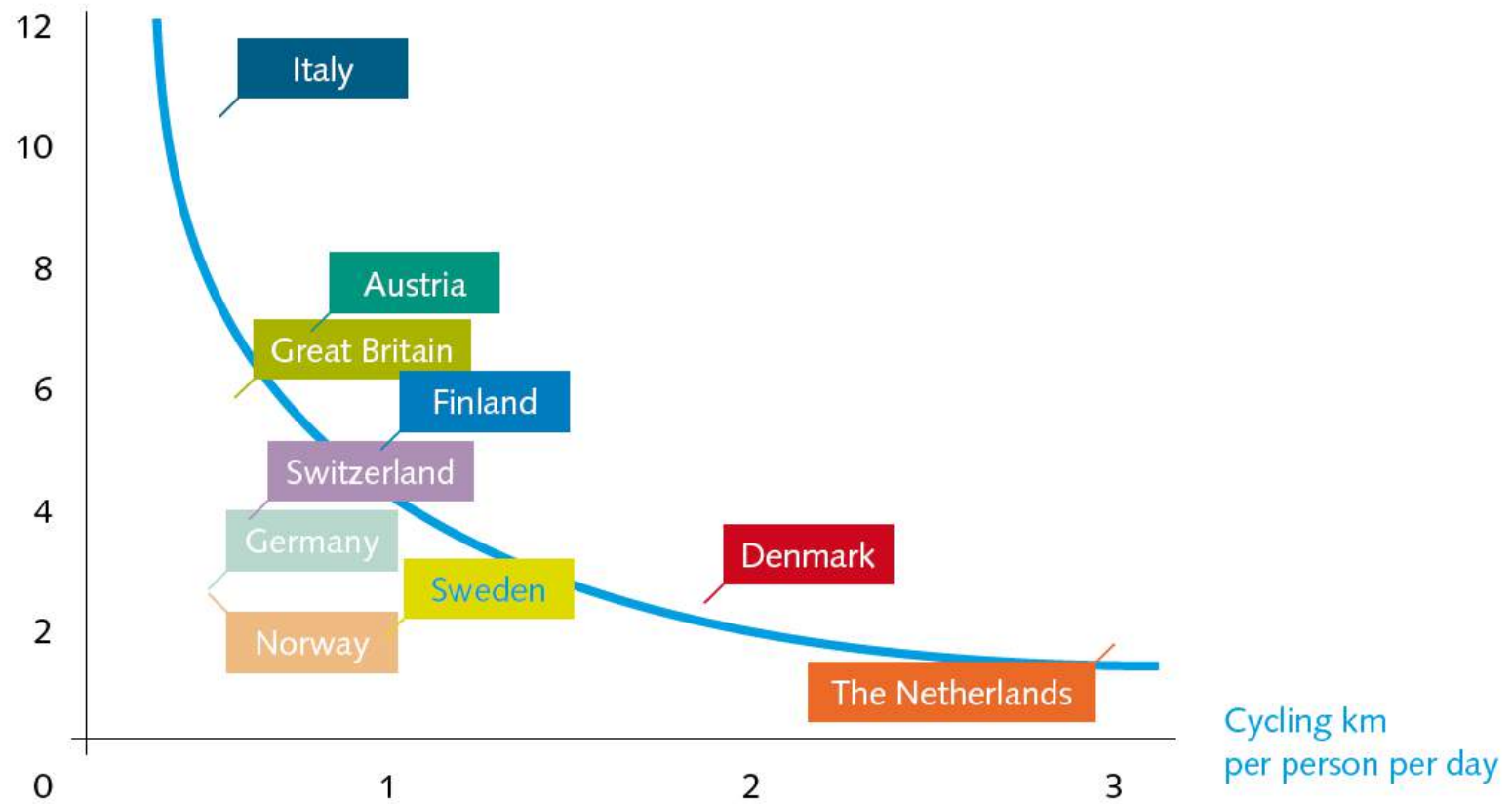
From the station







Killed cyclists  
per 100 million km



MOBYC... *Figure 8: Relation between accidents and bicycle usage*

## Designing the network (km/h)

highway



connector road



rural road



urban highway



artery road

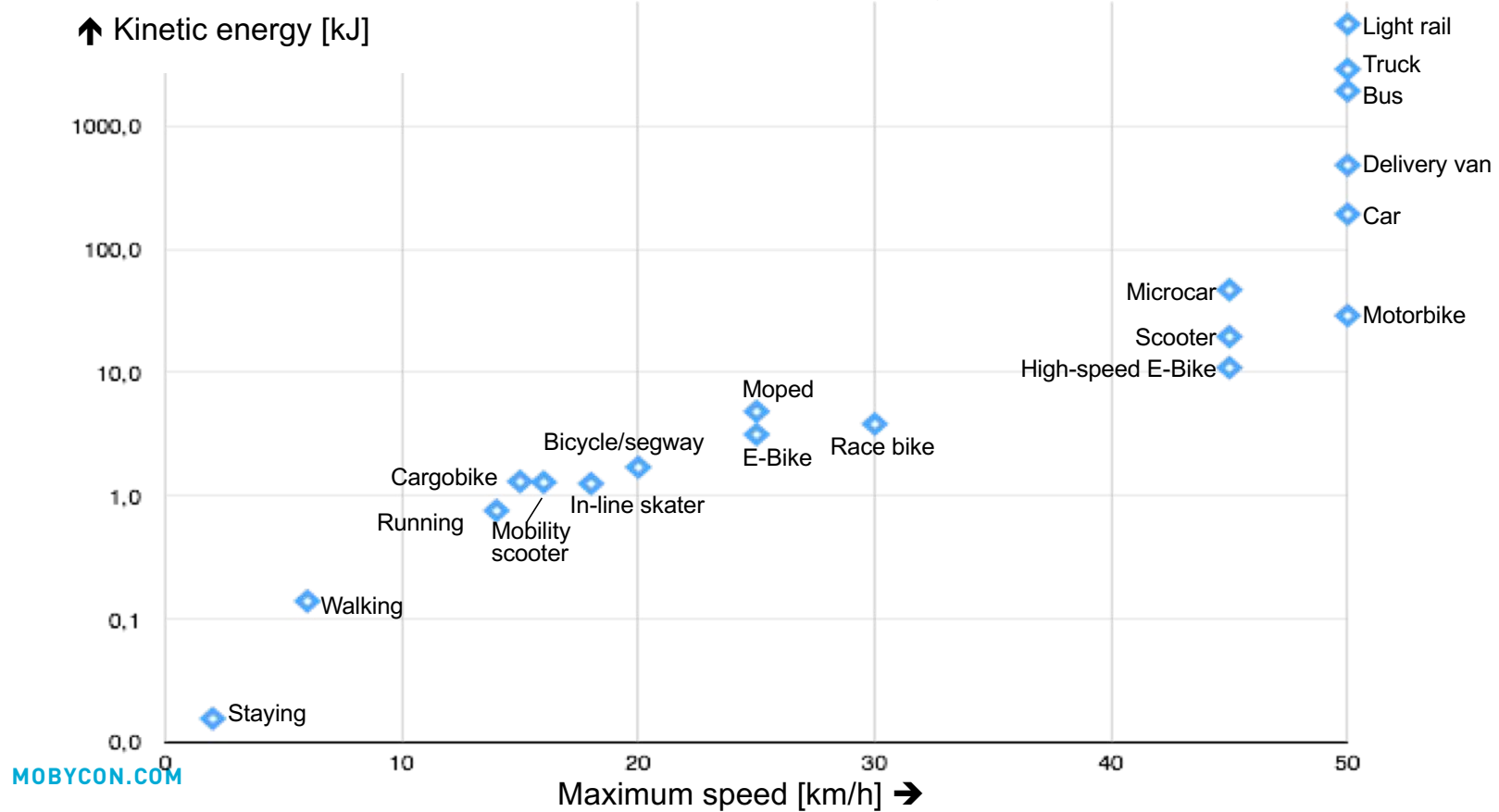


neighbourhood street



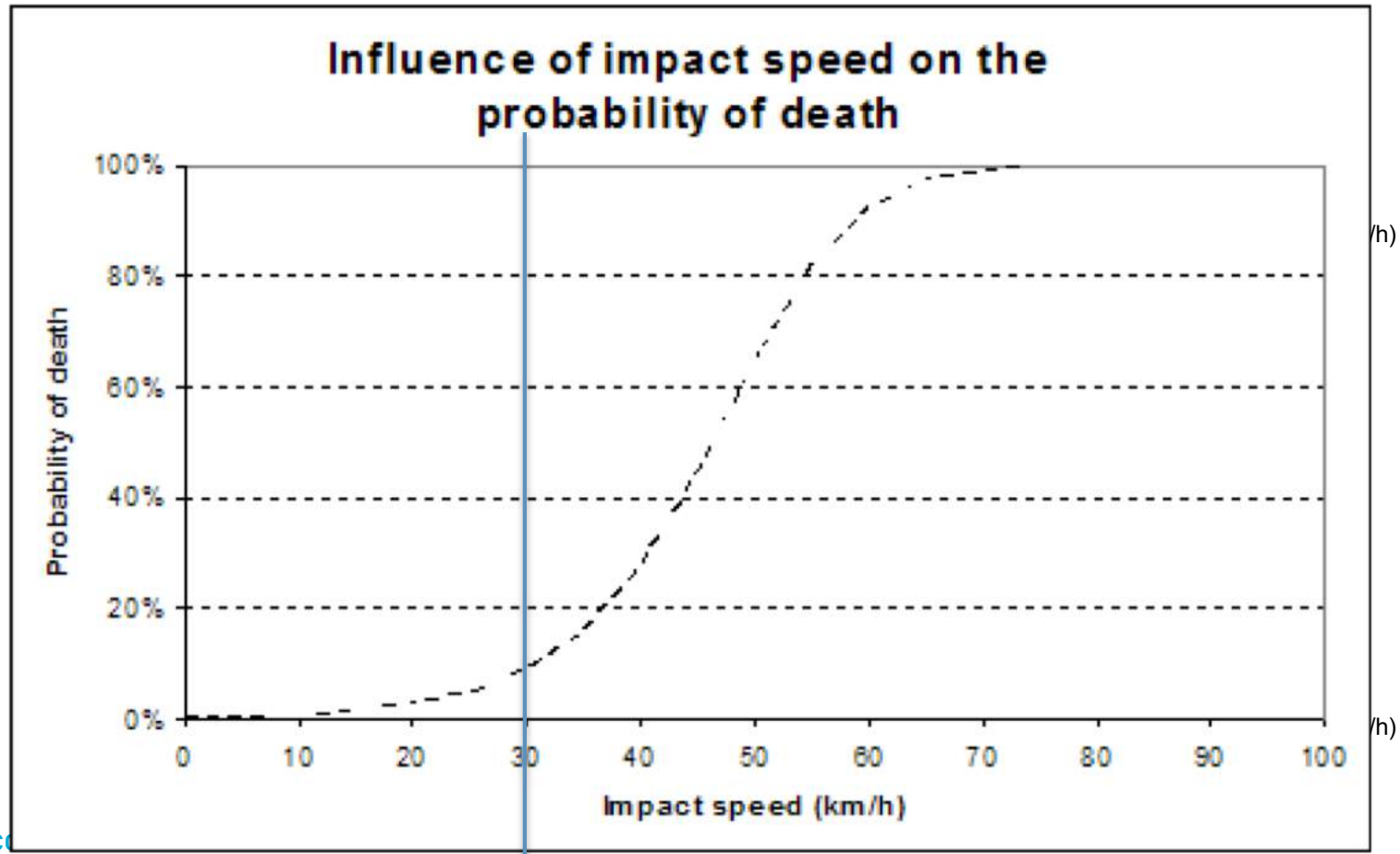
## Back to the basics

- Kinetic energy:  $E = \frac{1}{2} mv^2$  (at 'maximum' speed)

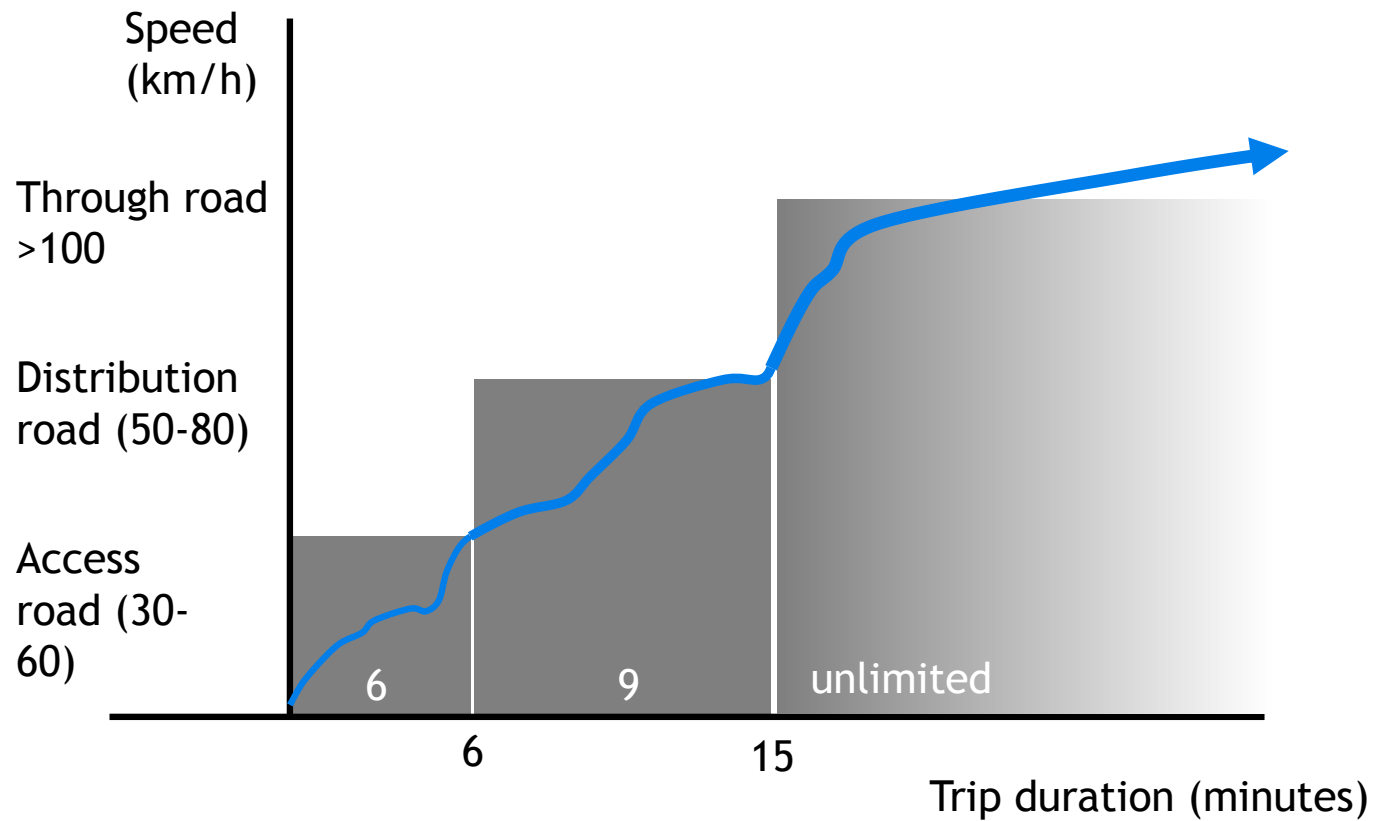




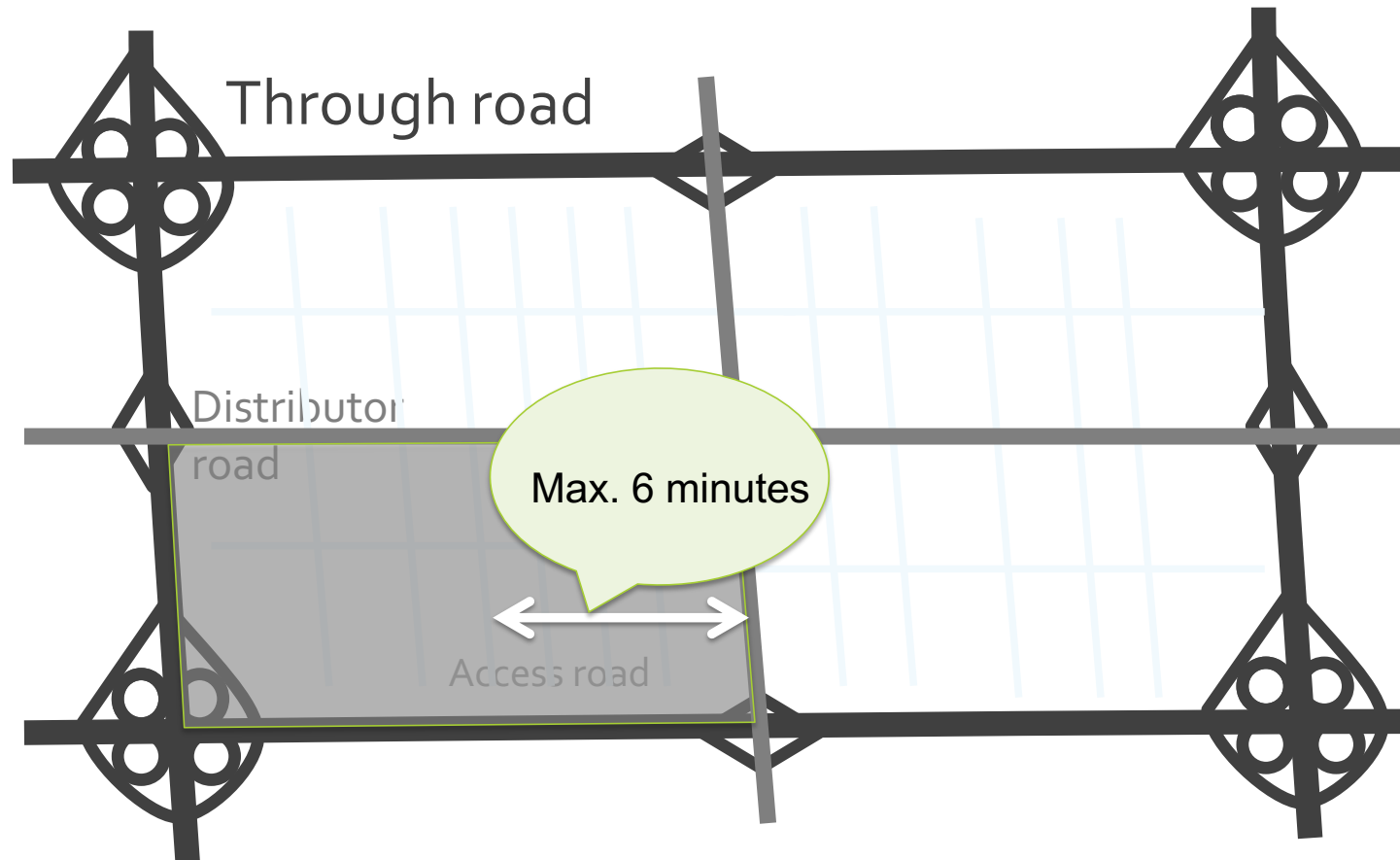
## Design principles



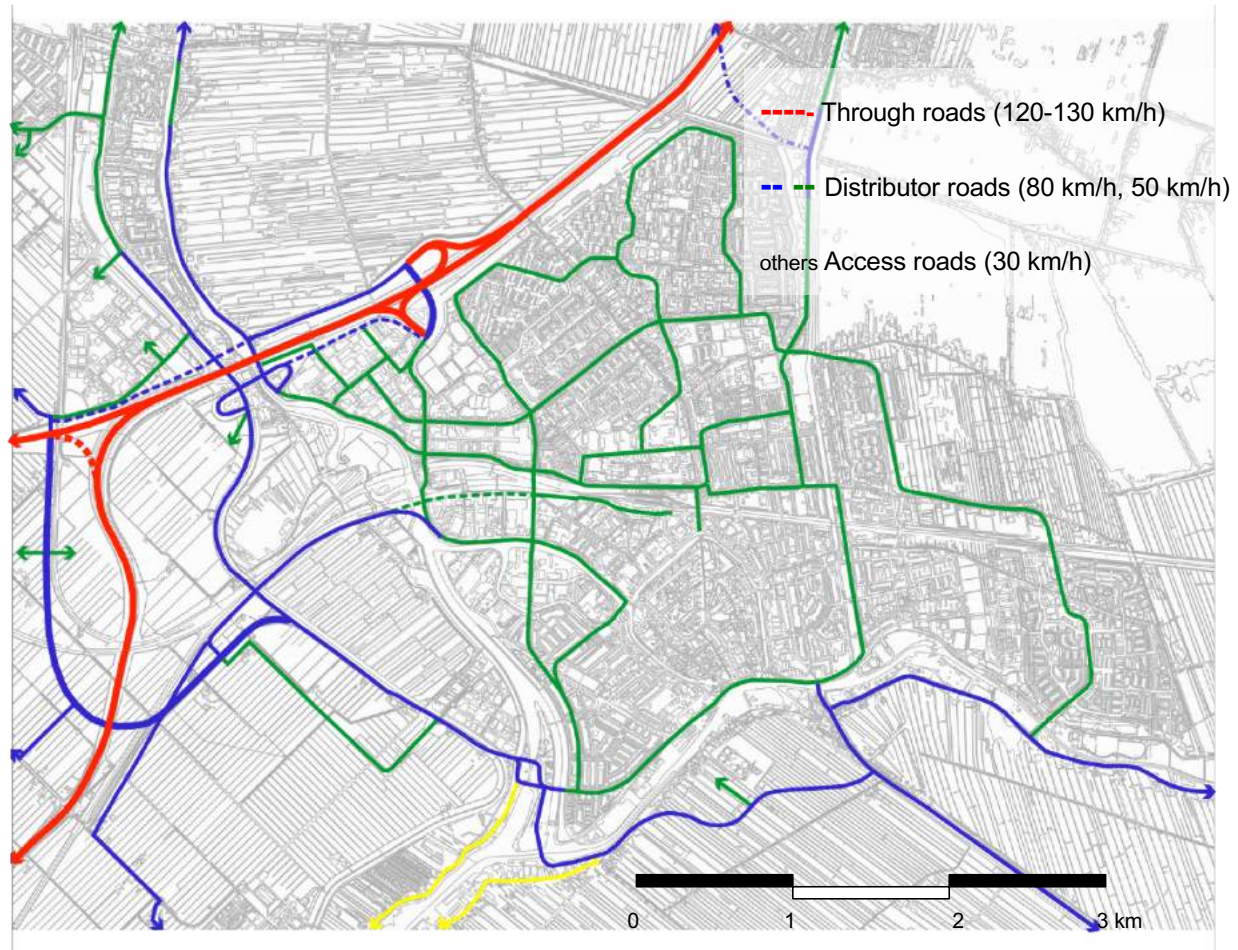
## Determine the mesh width



## Logical hierarchical network

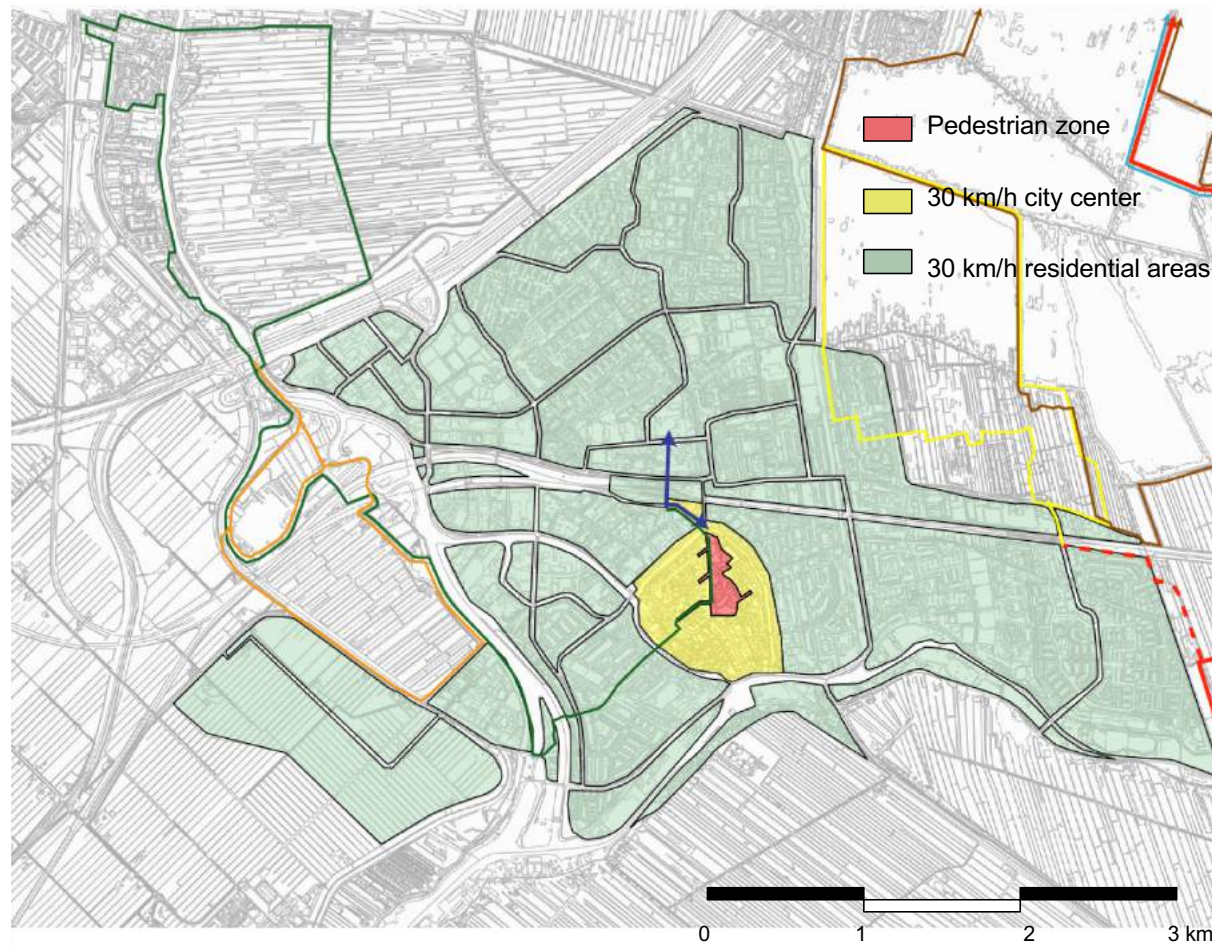


# Mesh Width for Vehicles in Gouda

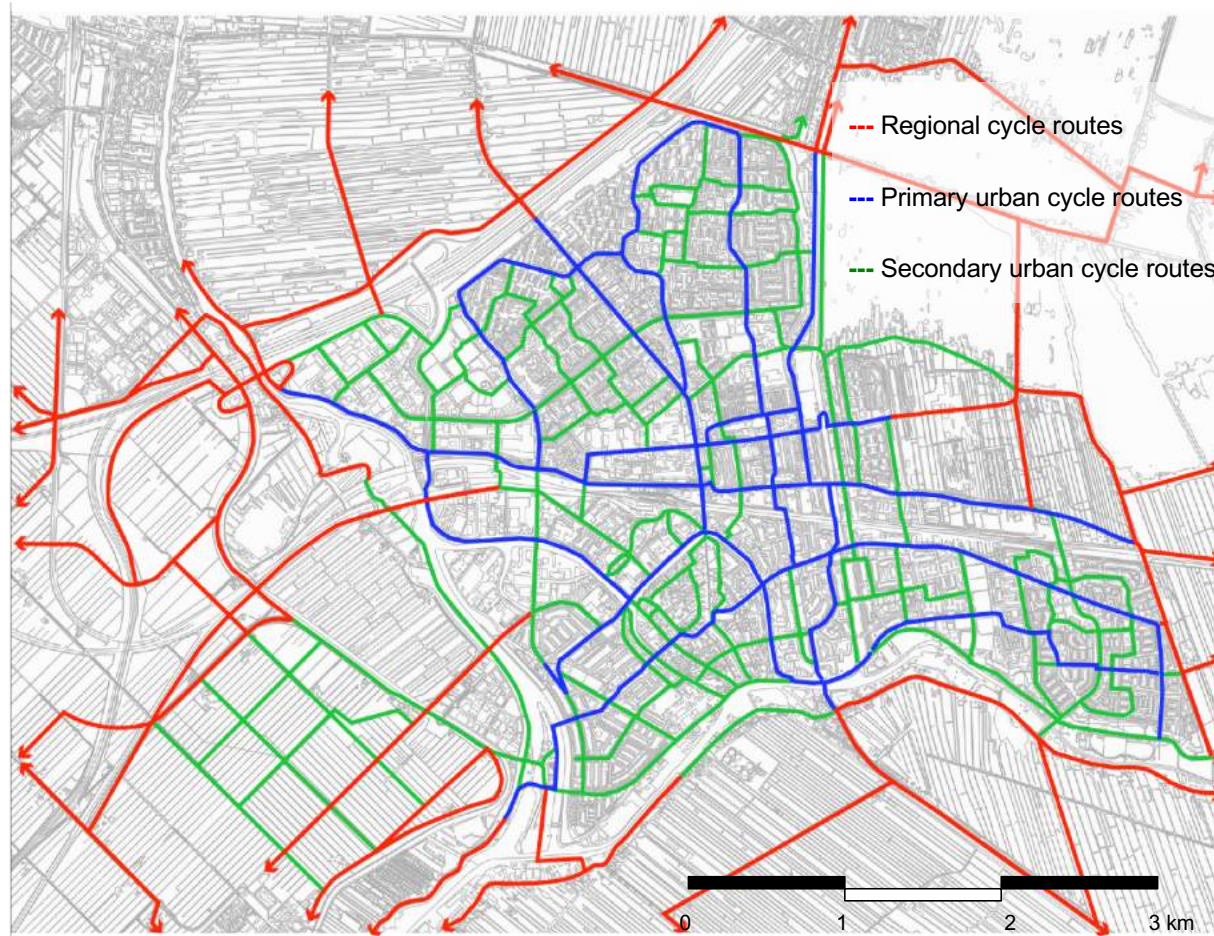




# People Places in Gouda

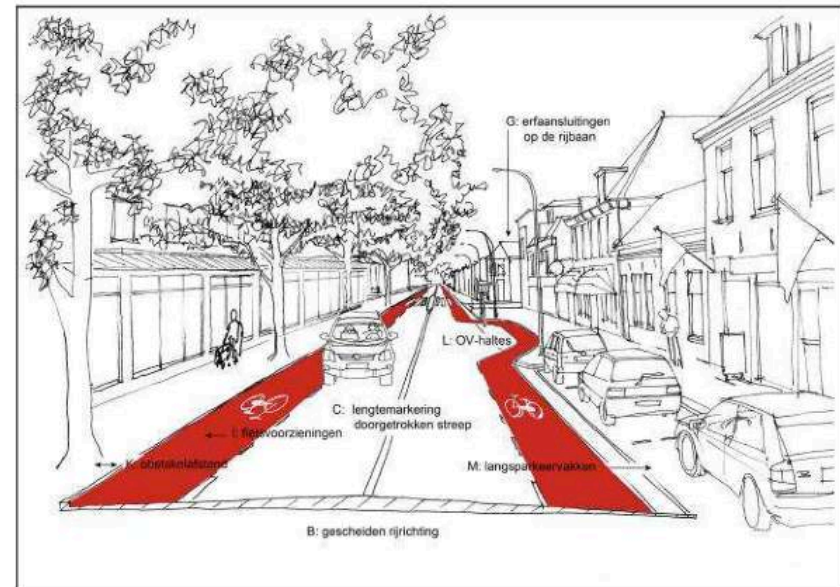
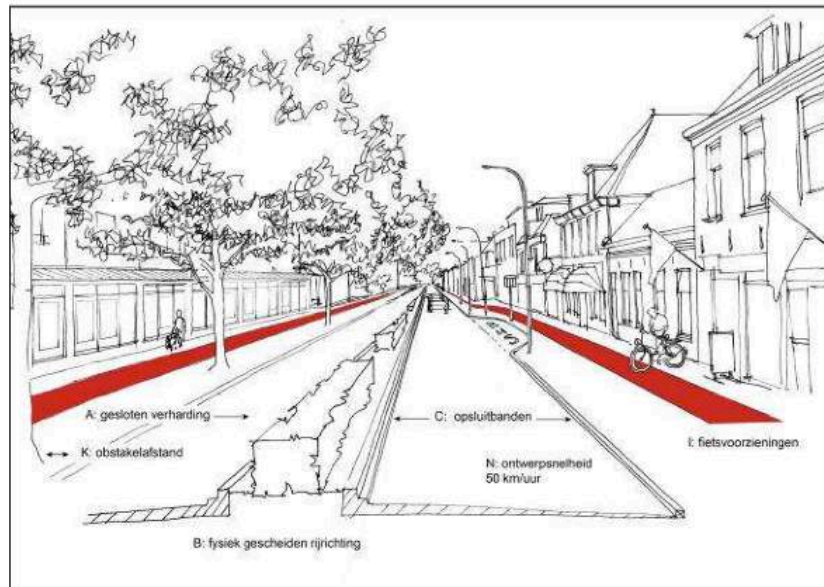


## Mesh Width for Bicycles in Gouda





## 30 mph Distributor/Collector



## 20 mph Local St

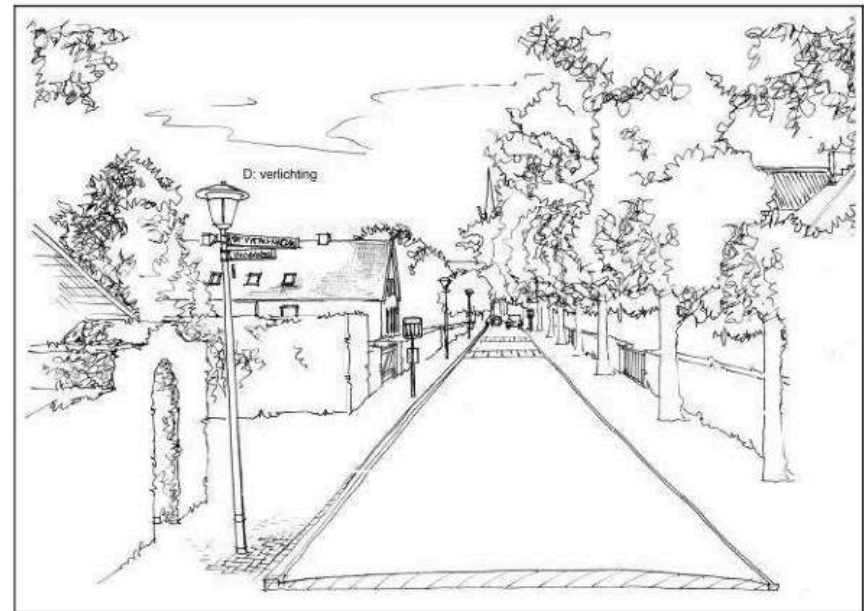
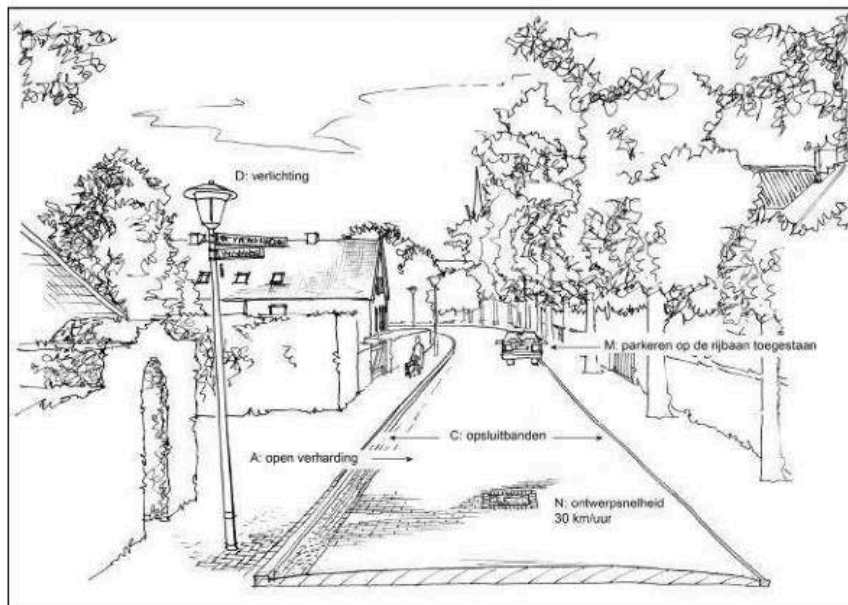














Photo credit: Google Streetview











## Sharrows?



## NOT A BIKE FACILITY

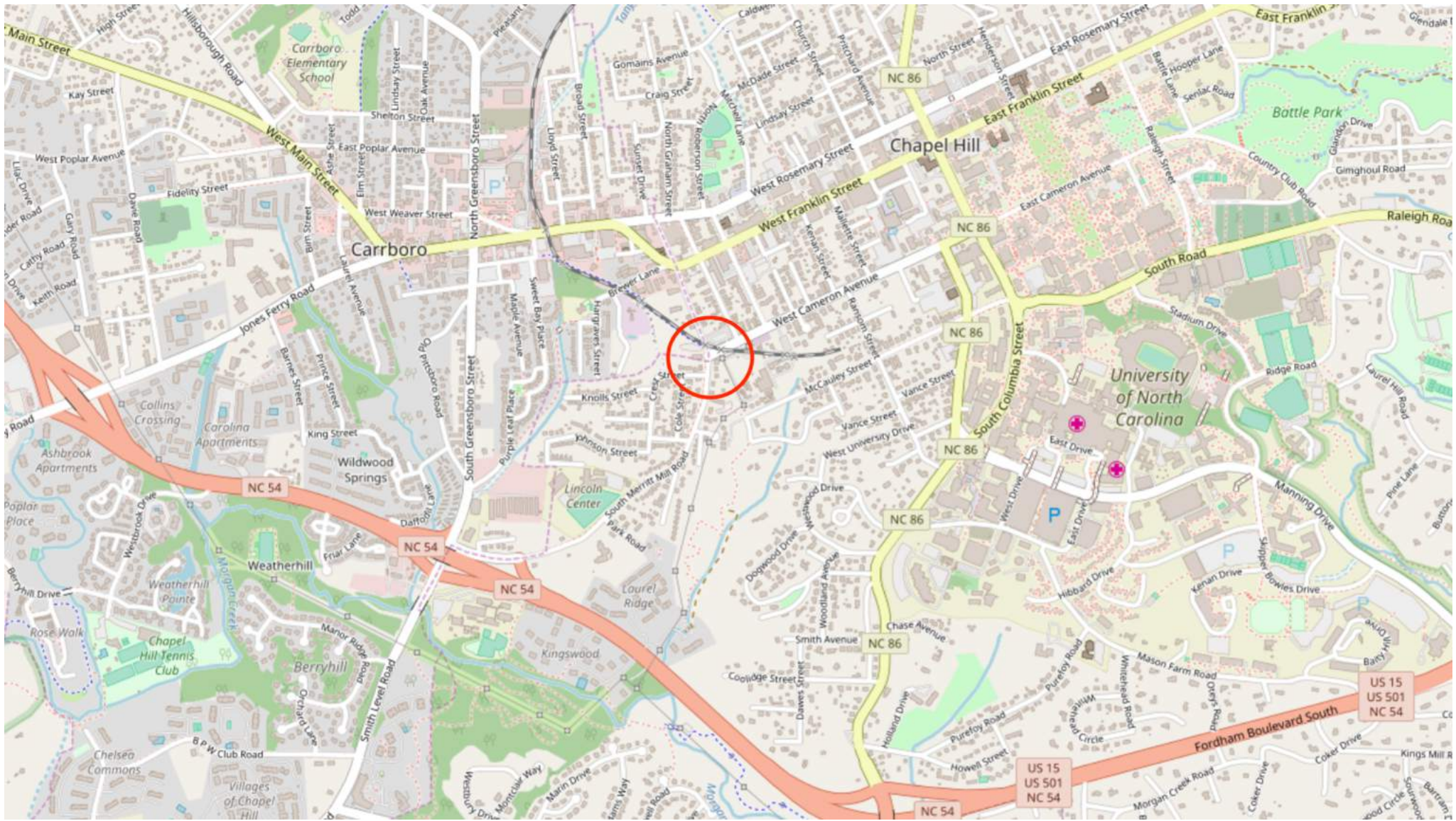




## CASE STUDY

### South Merritt Mill @ Cameron

TRAFFIC • MOBILITY • TRANSPORT





Merritt Mill Road and Cameron Avenue is the busiest intersection for bicycles in DCHC metropolitan area!

816 bicycles during peak periods

Peds 395 during peak hr

Merritt Mill N – 23'

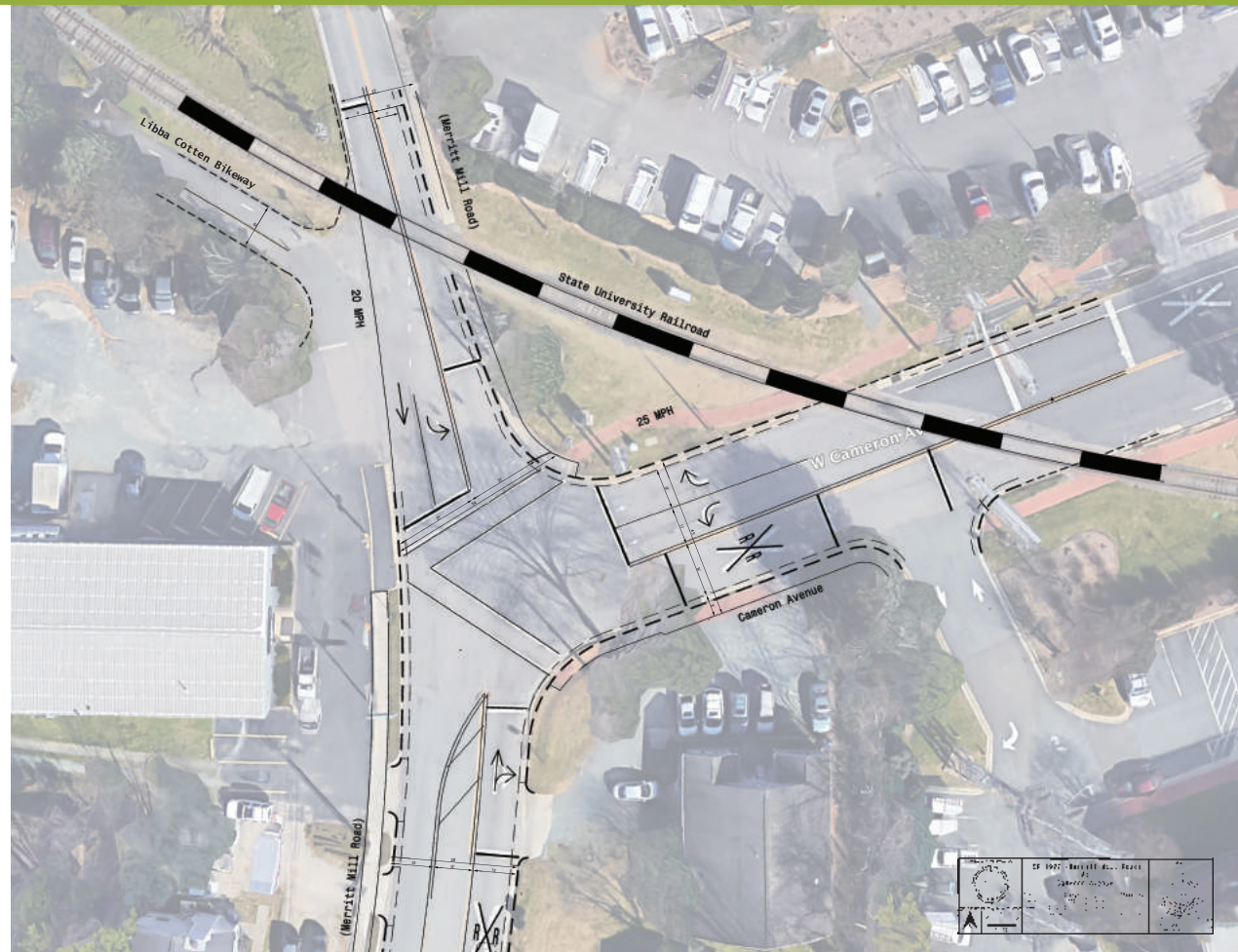
Merritt Mill S – 38'

AADT – 6,400 / 11,000

Cameron – 45'

AADT – 7,100

[MOBYCON.COM](http://MOBYCON.COM)



## Living Streets Lab #1: Streetmix

- Log onto [www.streetsketch.nl](http://www.streetsketch.nl)
- Use context & network considerations to develop the cross-sections you think are appropriate and safe for Merritt & Cameron  
INDIVIDUALLY
- What is currently built does not have to inform your design
- Your decisions for each street will help determine how you design your intersection.
- Save your final design for each street



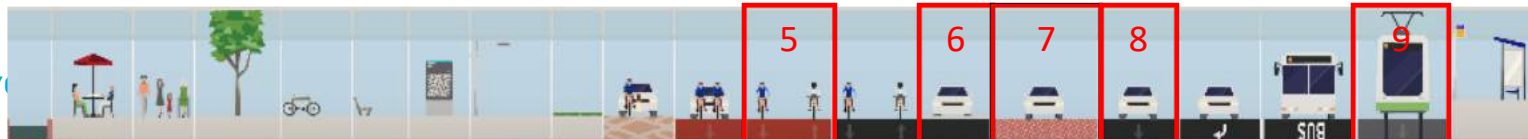
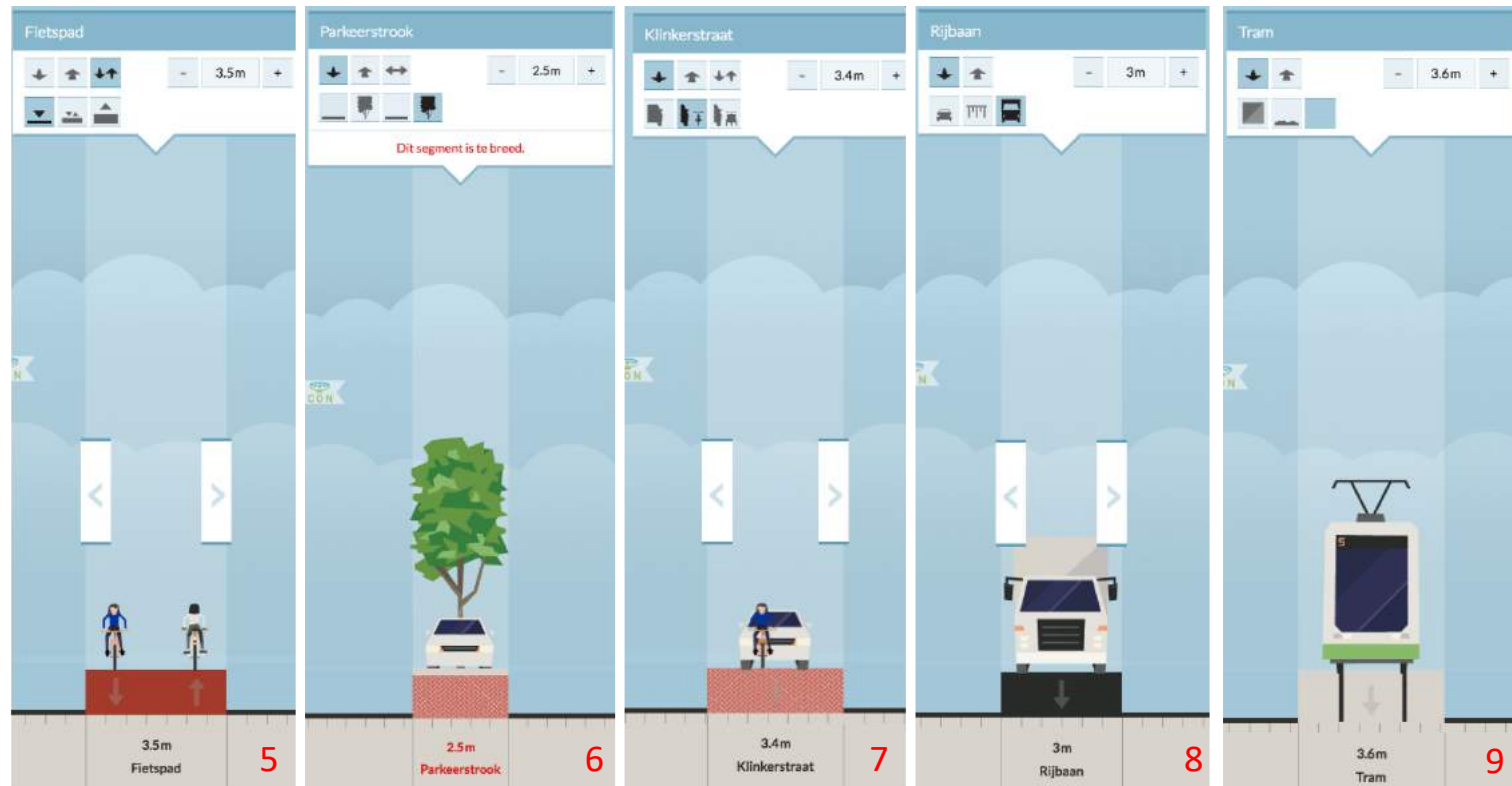
# Streetsketch



# Elements in Streetsketch



# Elements in Streetsketch



MOBYC

# Streetsketch





# INTERSECTION DESIGN FOR ALL USERS

CHAPEL HILL, NC (MARCH 16, 2018)

## Intersections: types

- Controlled intersection



- Uncontrolled



- Double / Turbo roundabouts



- Mini roundabouts



## Intersections: types

- Uncontrolled



- Square / Plateau



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- Punaise



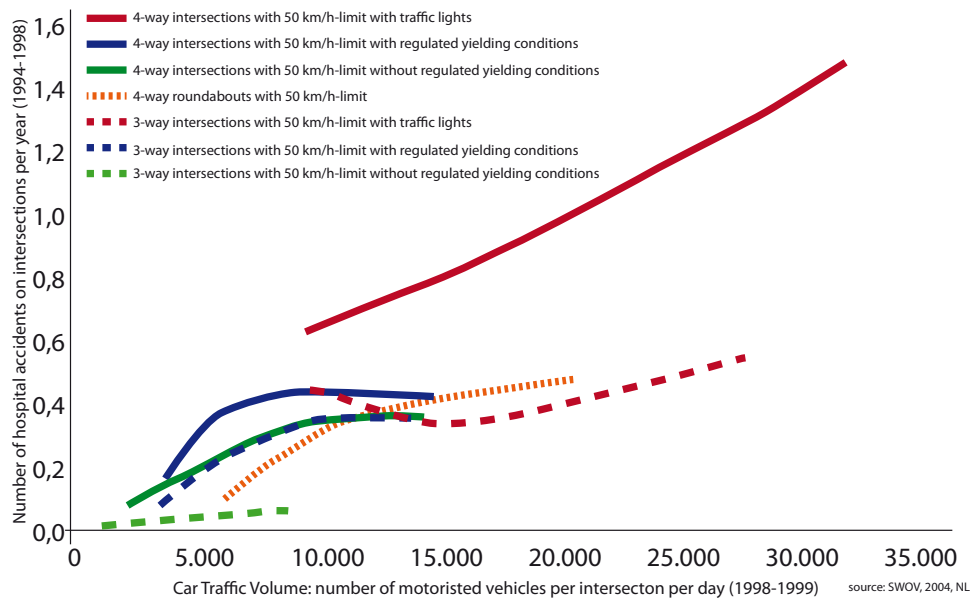
- Exit construction





**TRAFFIC LIGHTS ARE  
PROVEN TO BE LEAST SAFE  
INTERSECTION OPTION**

TRAFFIC LIGHTS ARE A  
TRAFFIC MANAGEMENT  
TOOL. NOT A SAFETY TOOL.



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## Safety first?

- Four-way signalized intersections are over twice as unsafe as their equivalent roundabouts



# Signalized intersections



## What not to do!



## What not to do!





## What not to do!



MOBY

bm\_mielec



## What not to do!



## What not to do!





## What not to do!



## Signalized intersections



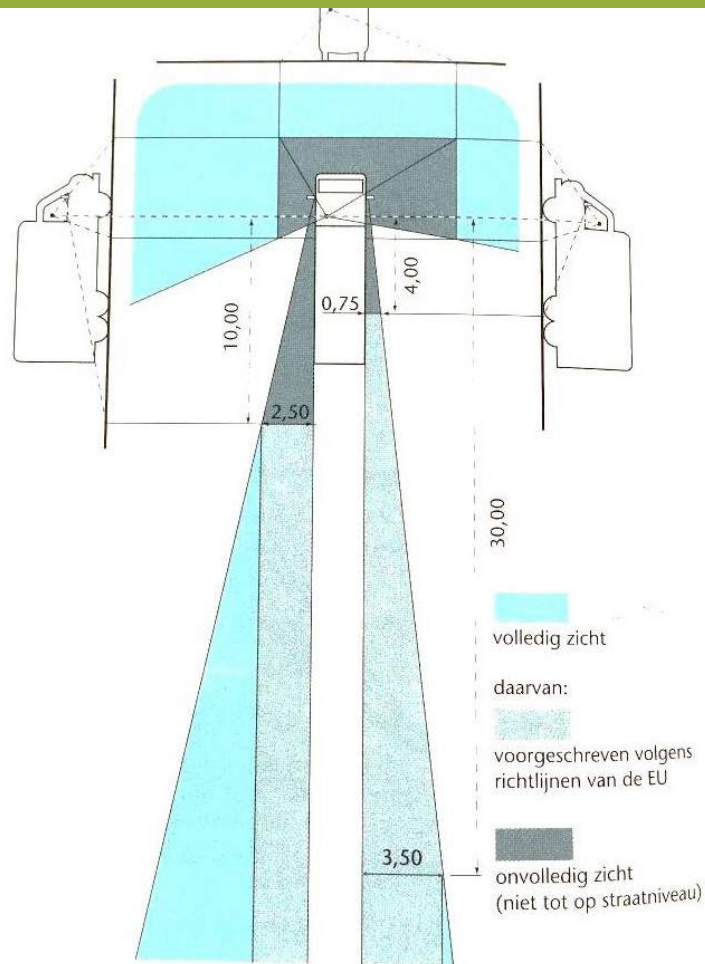
MOBY

## Signalized intersections





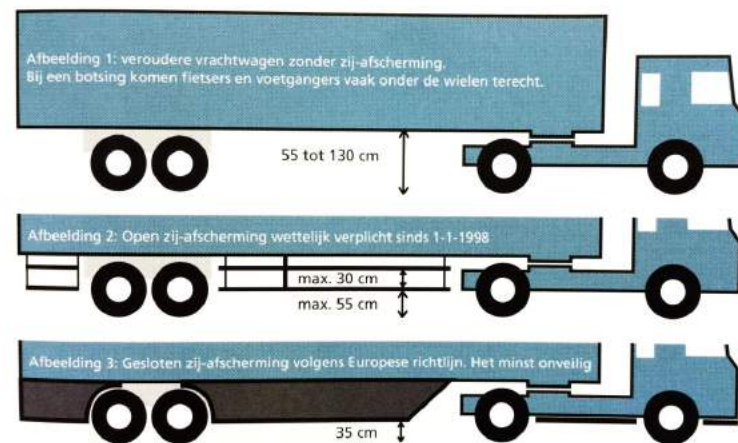
# Signalized intersections



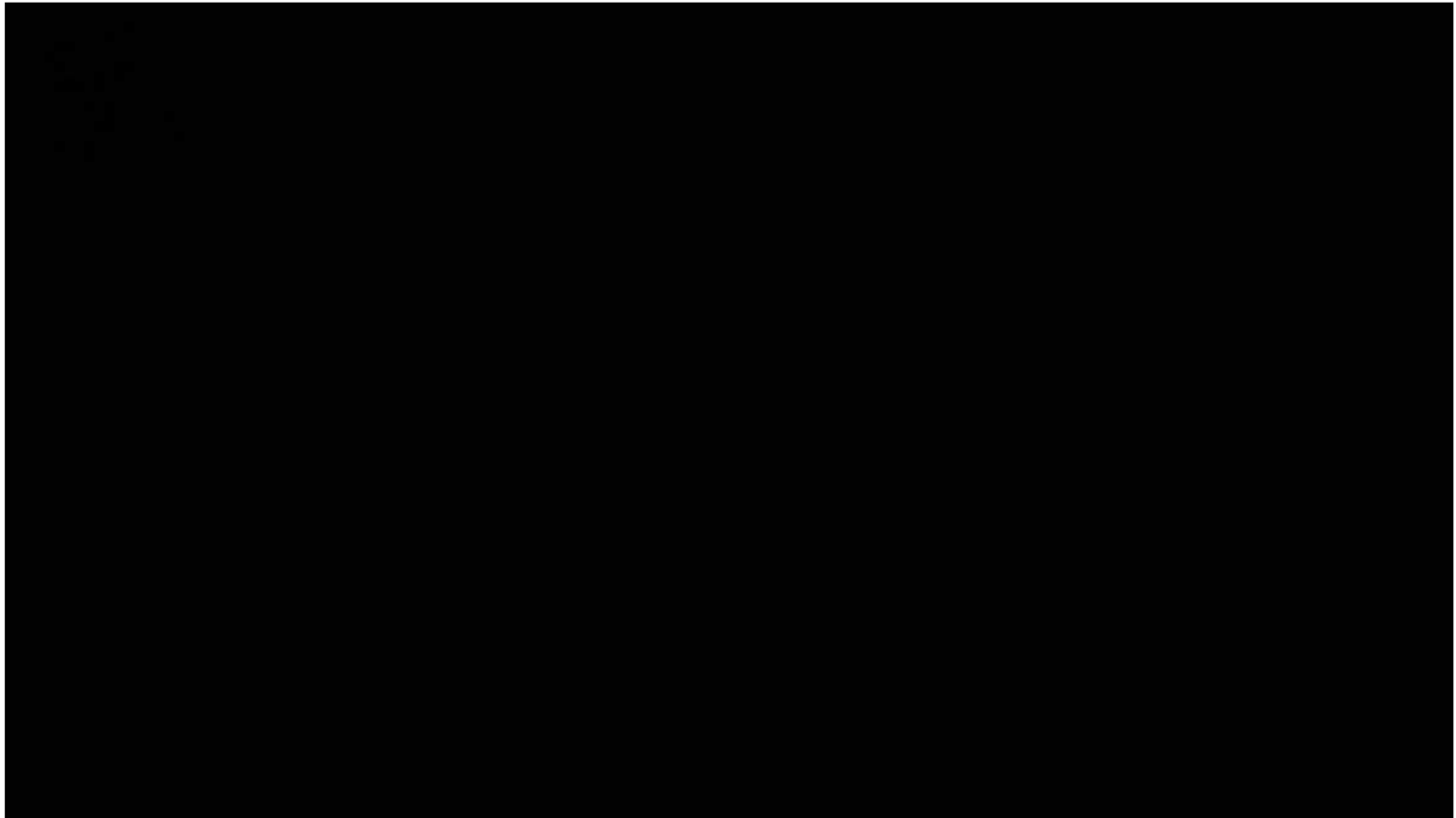
MOBYCO

Right turn: Vehicle characteristics

*Blind corner camera and mirror  
Guardrail.*



## Protected intersections: principles



## Protected intersections: principles





## Protected intersections: principles



## Protected intersections: principles





## Protected intersections: principles



MOBYC  
22-03-18



## Protected intersections: principles



MOBYC  
22-03-18

## Protected intersections: principles



MOBYC  
22-03-18

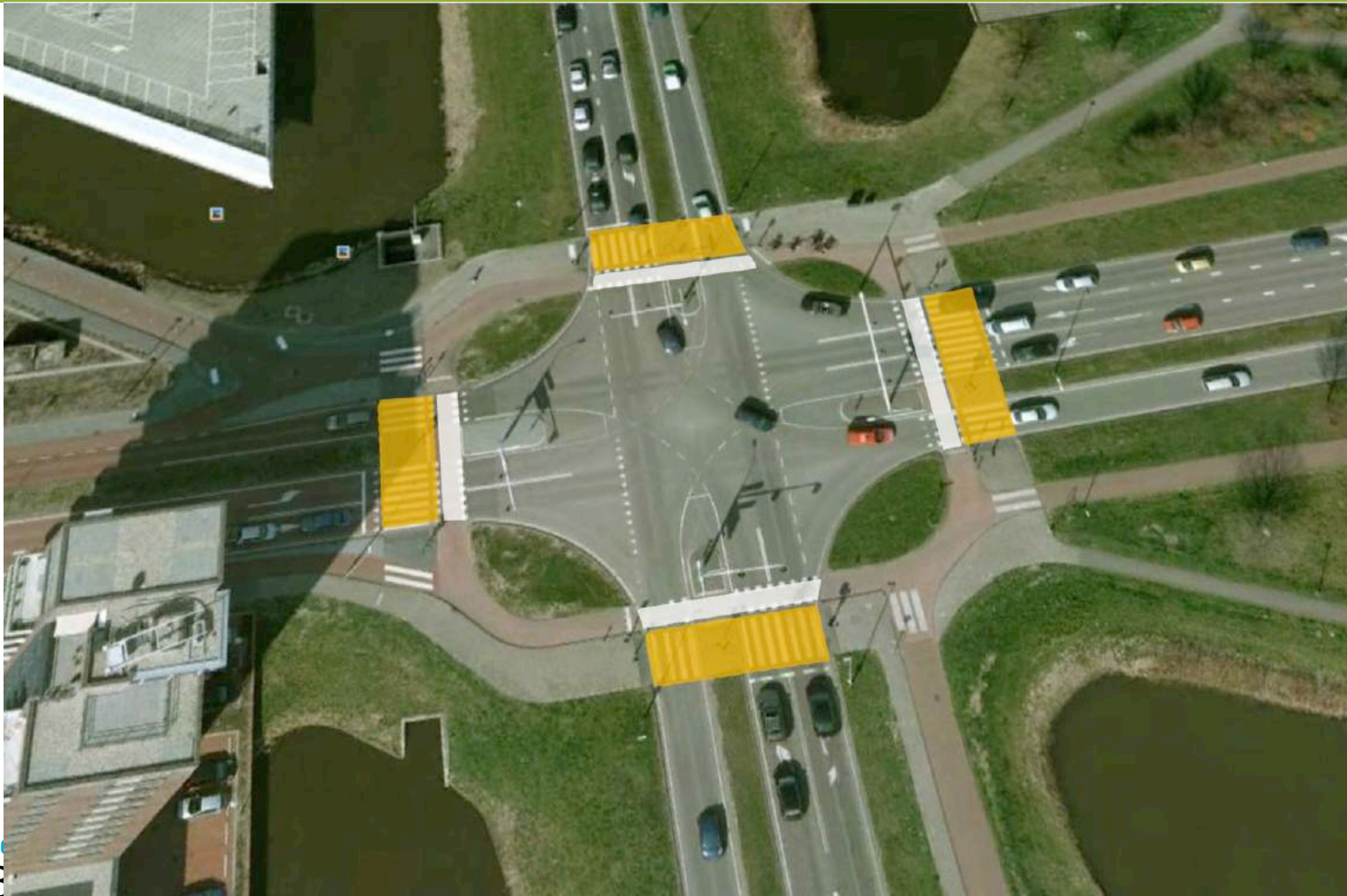


## Protected intersections: principles





## Protected intersections: principles



MOBYC  
22-03-18

## Protected intersections: principles





## Protected intersections: principles





## Signalized intersections



# Signalized intersections



## Signalized intersections



MOBYC



## Optimizing available space



MOB'

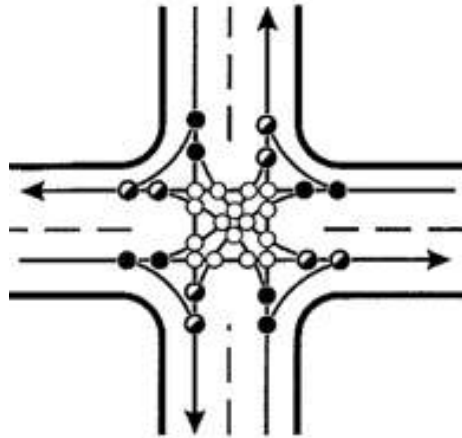


# ROUNDBABOUTS

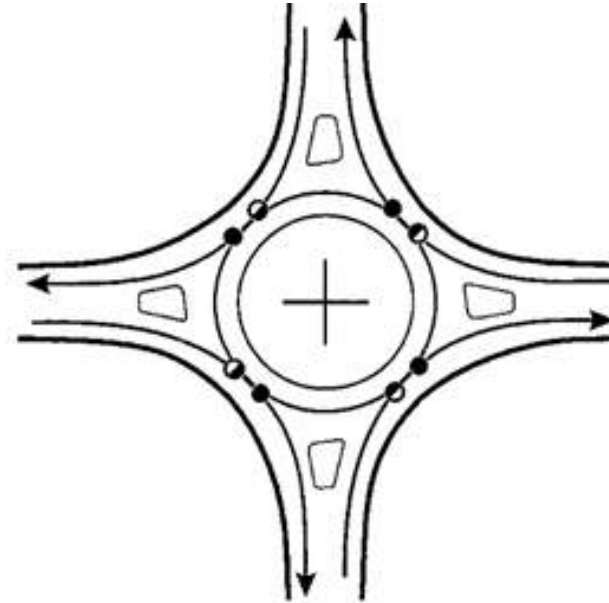
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# Roundabouts



●	Diverging	8
◐	Merging	8
○	Crossing	16
		<hr/> 32



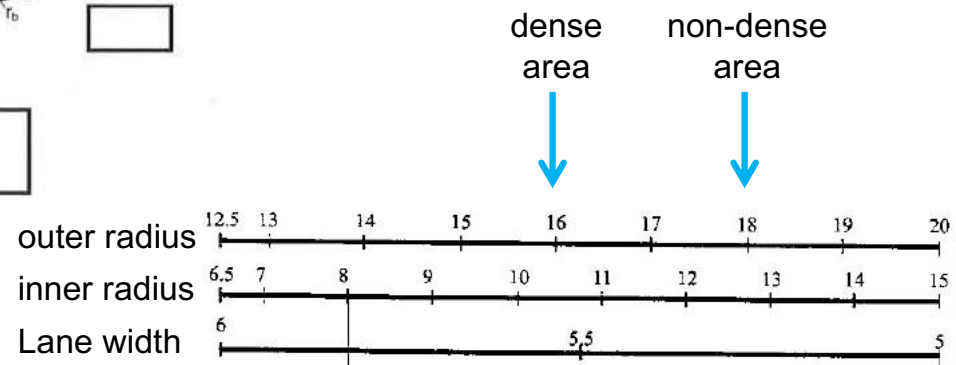
●	Diverging	4
◐	Merging	4
○	Crossing	0
		<hr/> 8



- Single-lane roundabouts

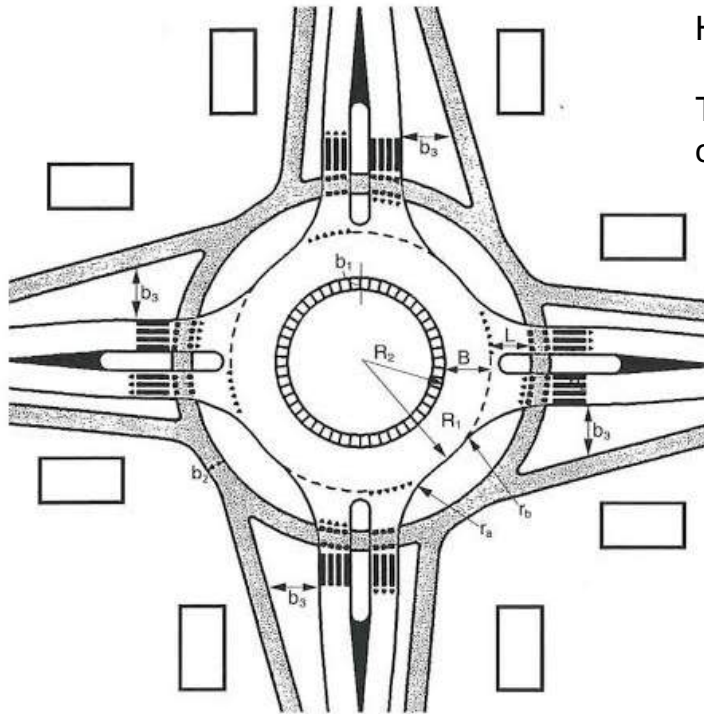


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# Roundabouts

- Single-lane roundabouts



Here cars are yielding to bicycles.

The distance separating the bike path from the car lane is equal to a lane width.

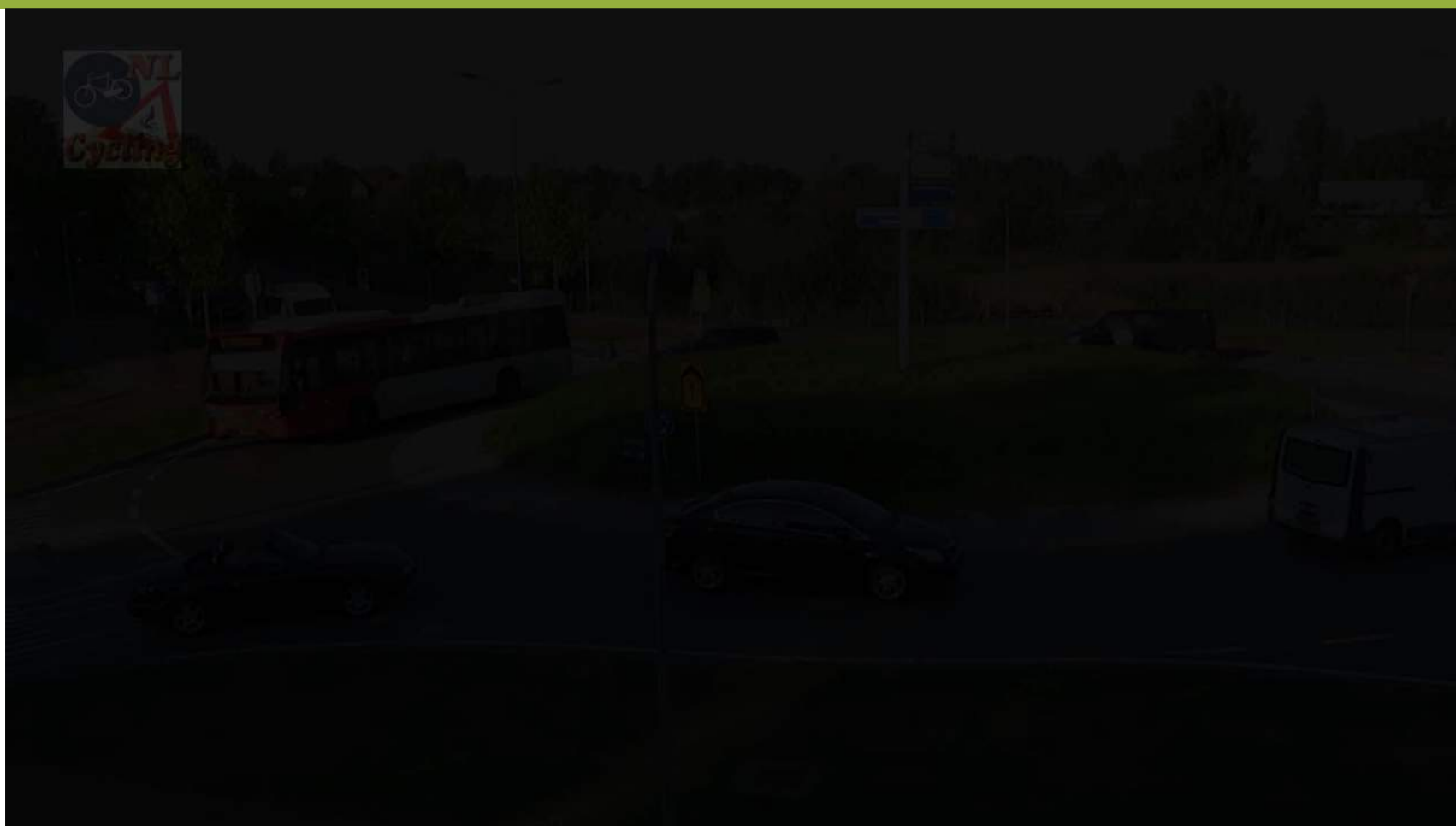
outer radius  
inner radius  
Lane width



## Design vehicle vs Control vehicle

- Design for passenger cars
- Control for large vehicles (bus)
- Aprons. Rumble strips





# Roundabouts









From this...



To this...



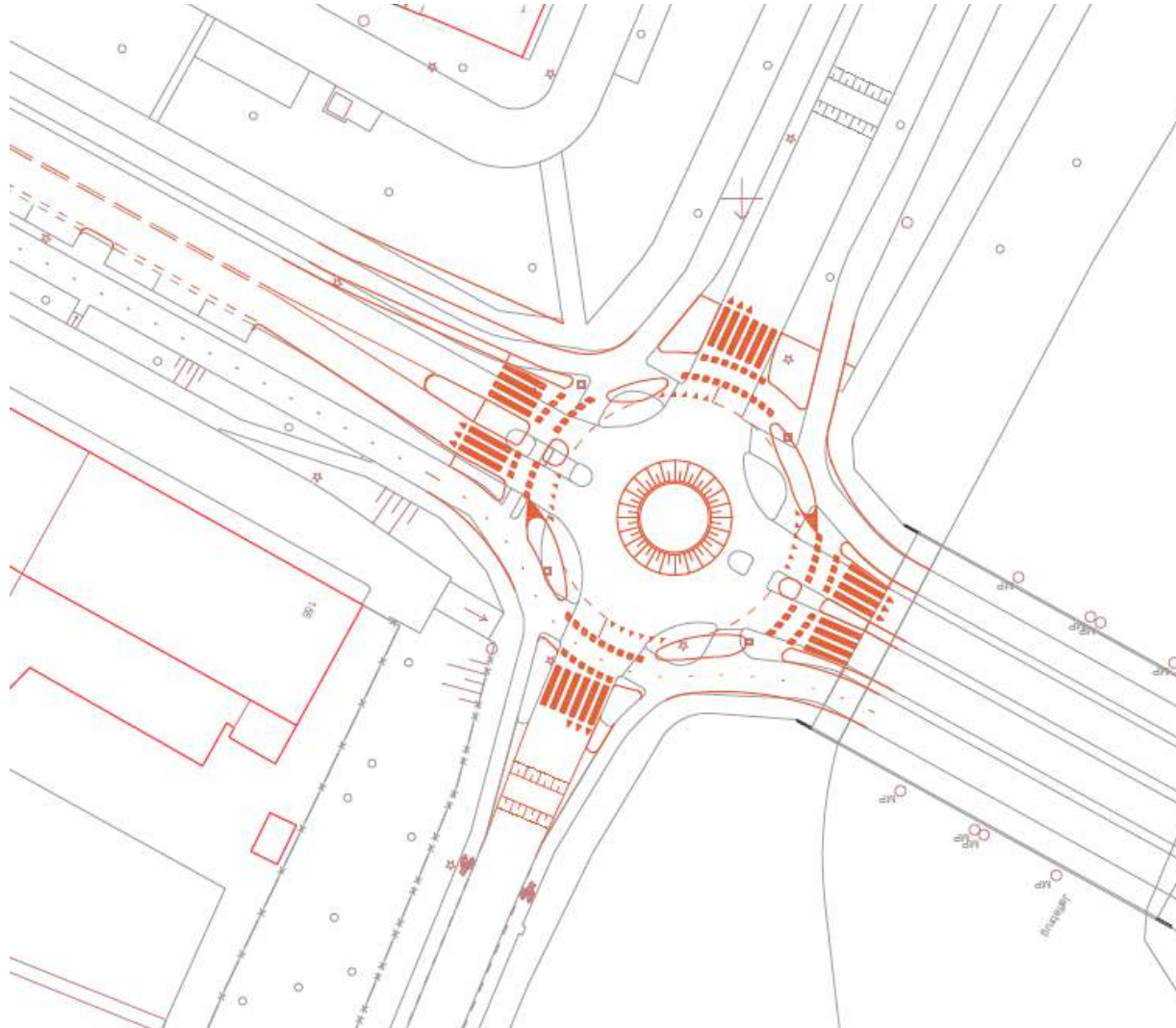


# Roundabouts

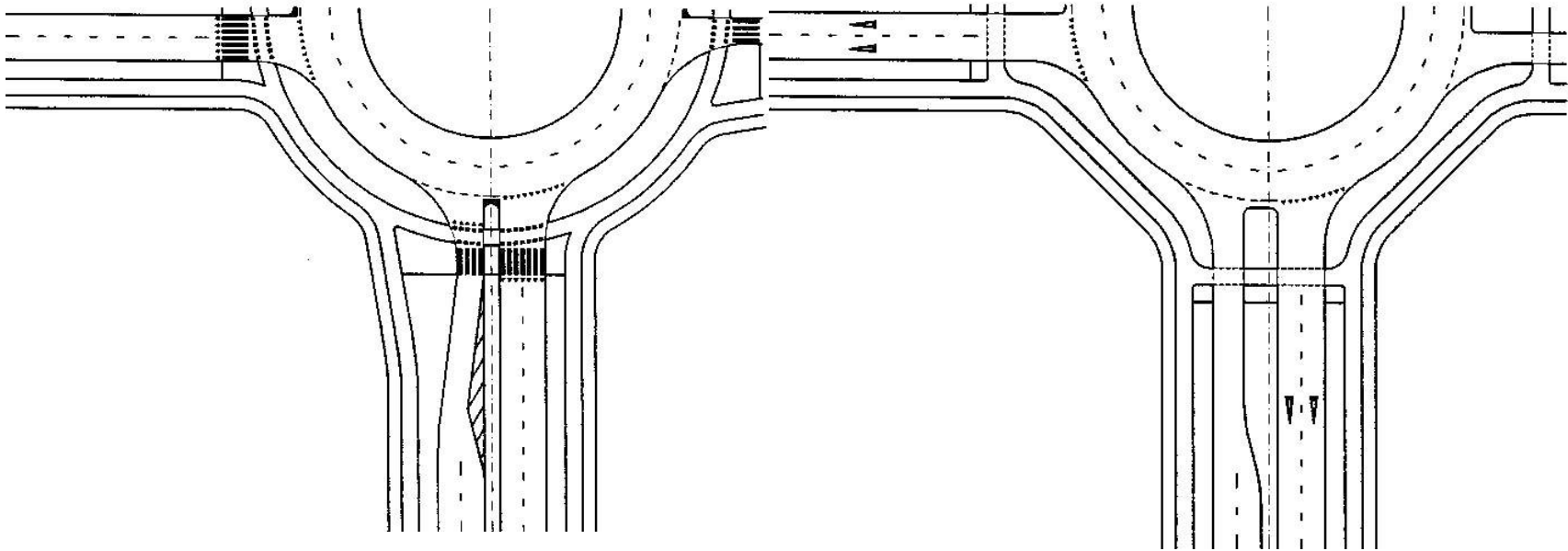








## Two-lane Roundabouts



Dutch guidelines state that within the build up area cyclists have right of way

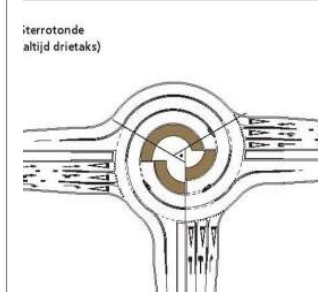
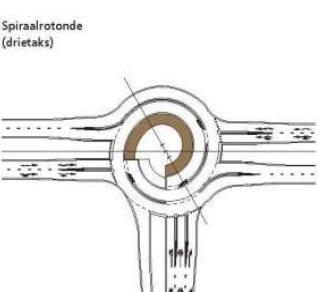
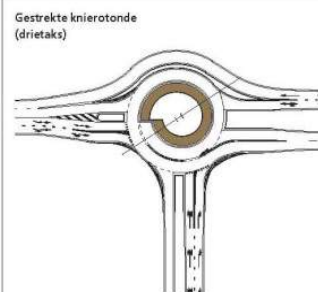
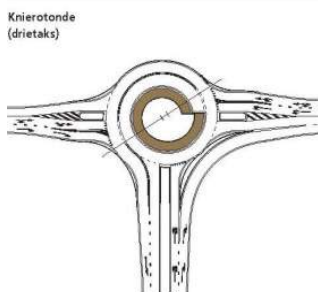
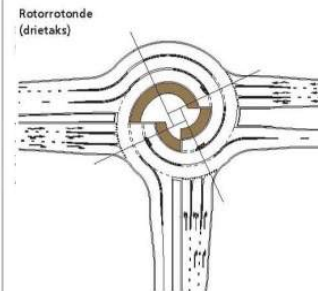
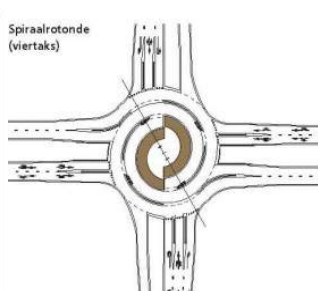
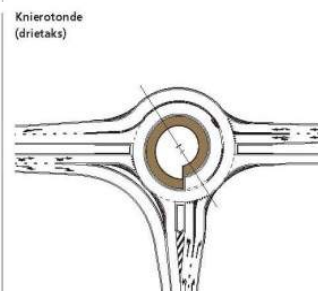
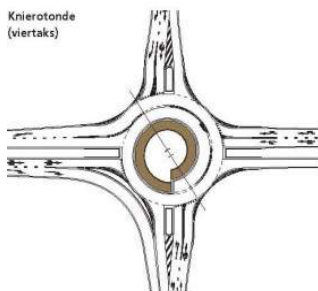
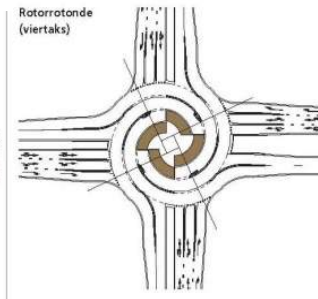
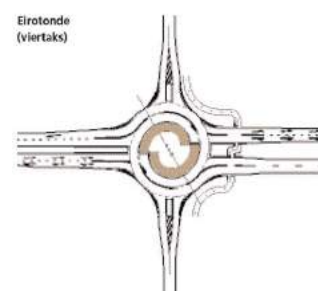
And outside of the build up area must yield



## Turbo roundabouts



# Turbo roundabouts





## Turbo roundabouts

- Turbo-roundabout with cyclists having right of way





## Turbo roundabouts

- Turbo-roundabout with cyclists having to yield



## OTHER INTERSECTION TREATMENTS

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## Shared Space



**schlijper.nl**  
today















## Fietsrotonde





# Rotorrotonde





# LARGAS



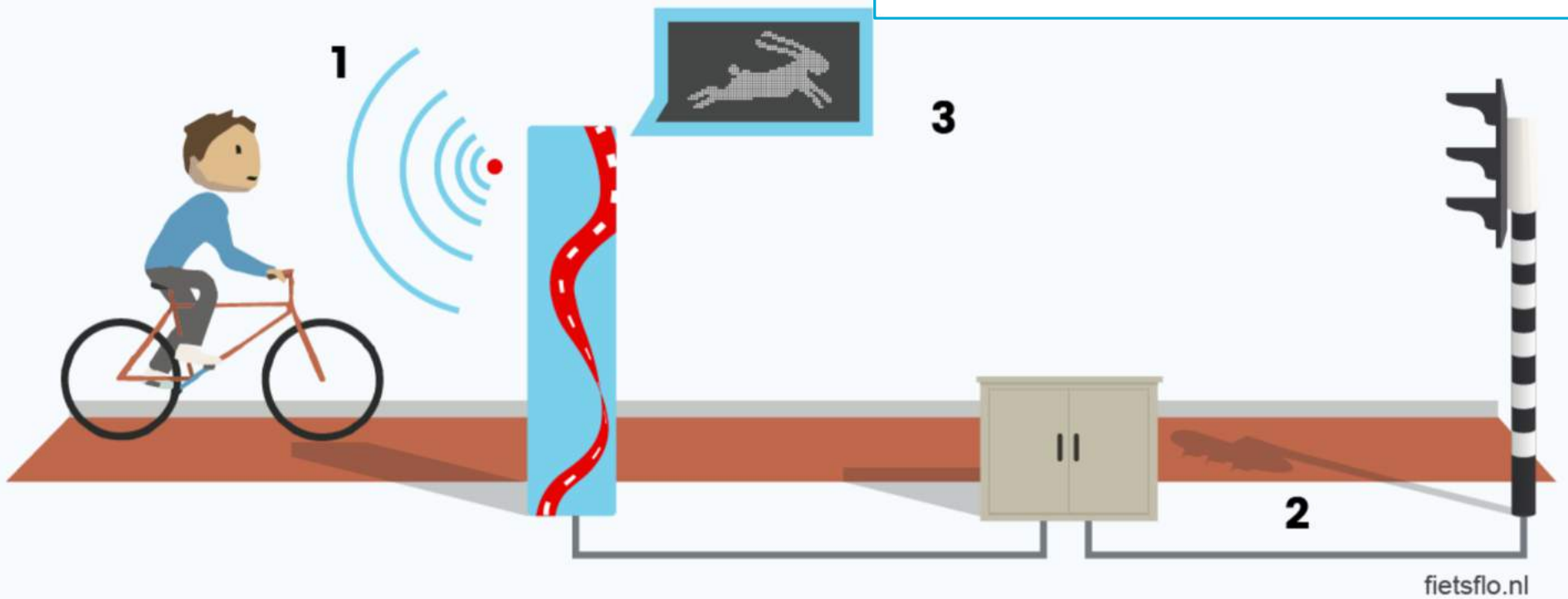


## All Directions Green



[MOBYCON.COM](http://MOBYCON.COM)

# Flo



Back to the future?

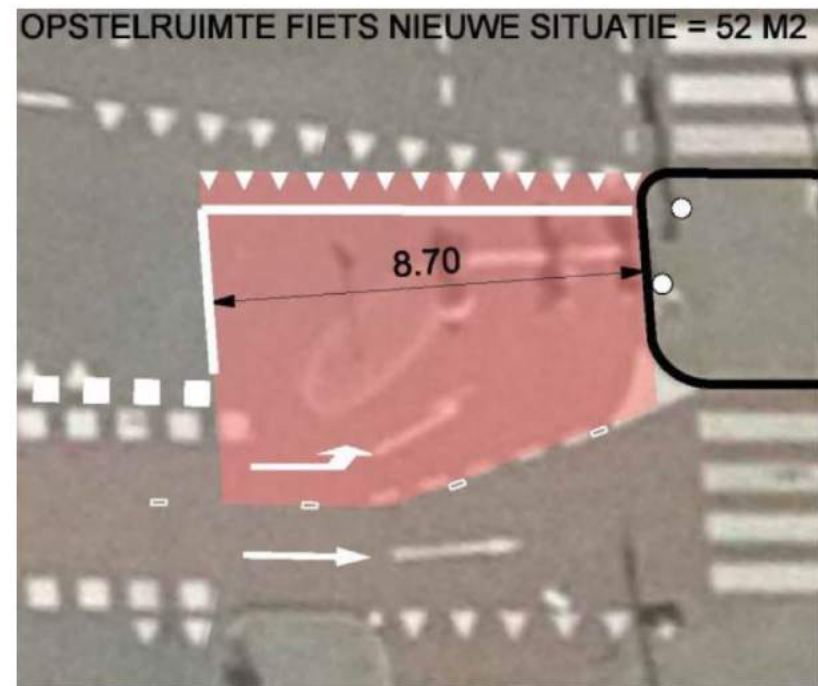




## Back to the future?



*Opstelruimte fiets oud: 27 m2*

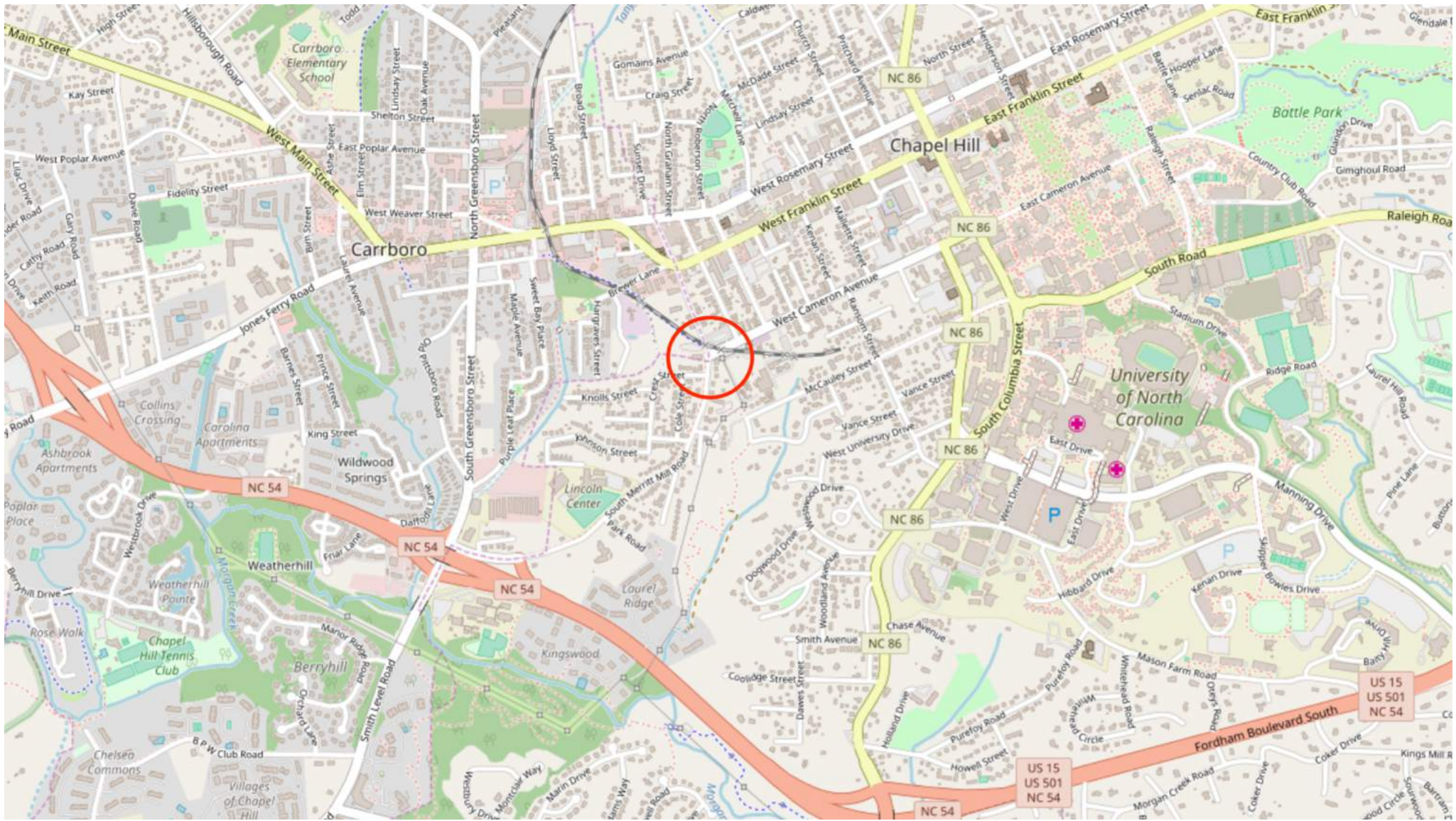


*Vergroten opstelruimte fiets: 52 m2*

## CASE STUDY

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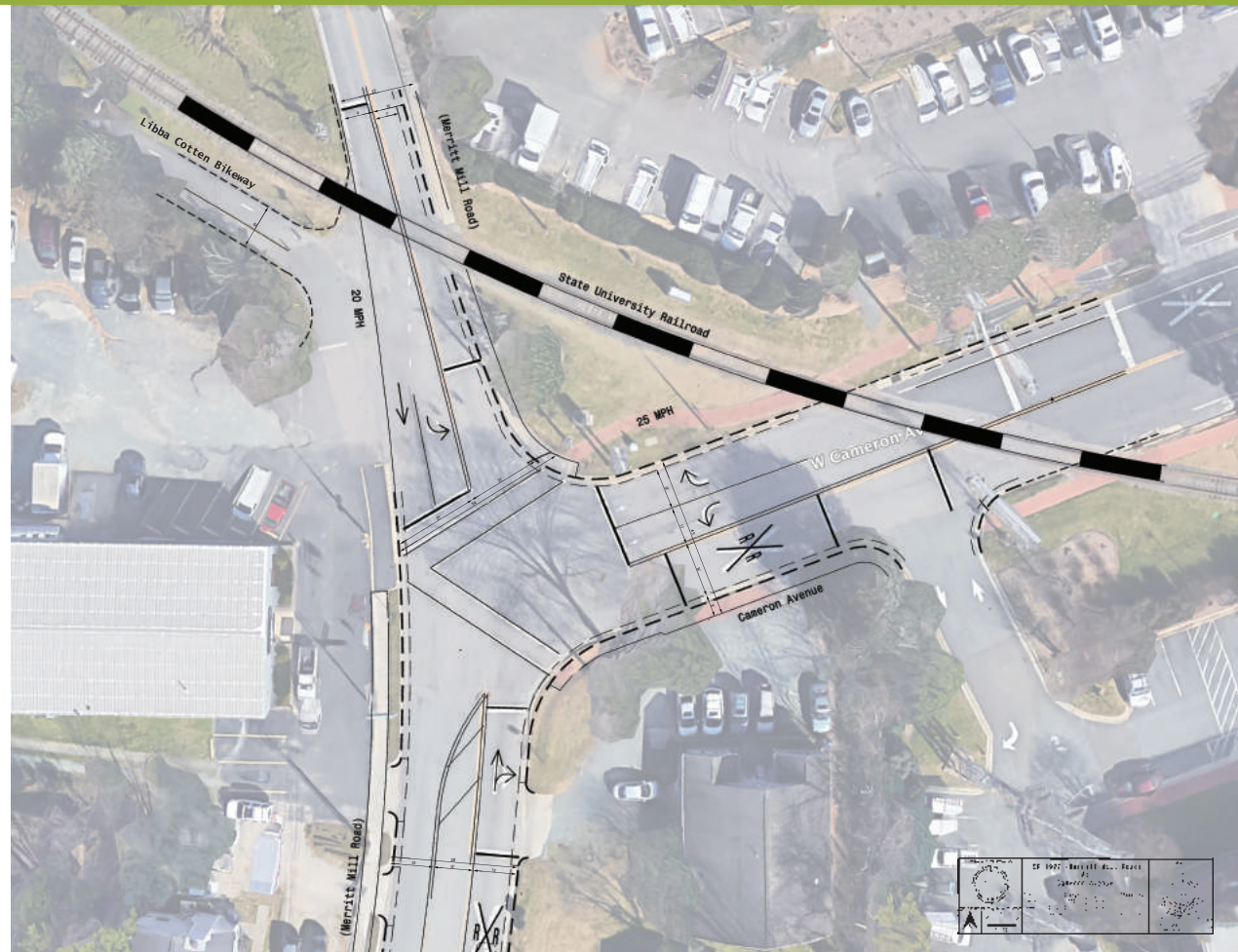
Merritt Mill S – 38'

AADT – 6,400 / 11,000

Cameron – 45'

AADT – 7,100

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## Living Streets Lab #2: Intersection Design

- Bring up your cross-section for all three streets at the study site
- Use your this to inform your requirements at the intersection
- Using the tracing paper over the maps, draw your desired intersection design to accommodate all road users
- Provide as much detail as you feel is necessary (texture, raised features, color, etc.)

