



# Pedestrian and Bicyclist Safety at Intersections

December 6, 2019



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## RSTF Goal:

To reduce roadway crashes and eliminate serious injuries and fatalities from crashes in the Delaware Valley

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tag **@DVRPC**

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# Pedestrian and Bicyclist Safety at Intersections

December 6, 2019



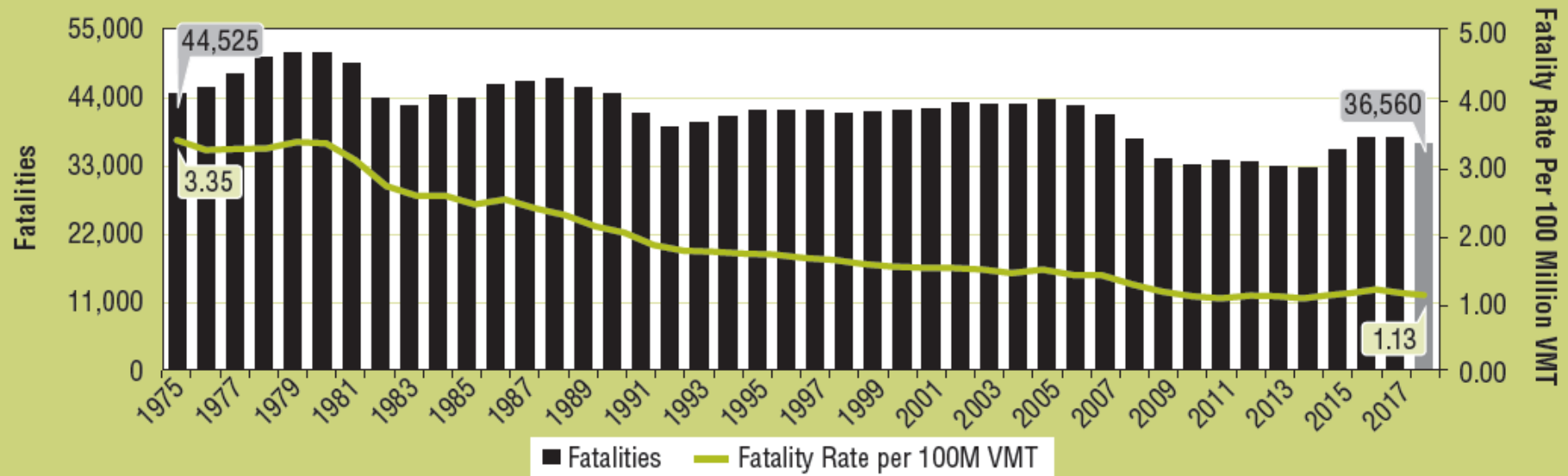
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## NHTSA: U.S. Fatal Motor Vehicle Crashes, 2018

- **36,560** people killed in crashes:
  - 2.4-percent **decrease**, from **37,133** in 2018
  - VMT **increased** 0.3 percent ('17 to '18)
    - *Decrease in K-crashes + increase in VMT = 3.4 decrease in Fatality Rate to 1.13*

Fatalities and Fatality Rate per 100 Million VMT, by Year, 1975-2018



Sources: FARS 1975-2017 Final File, 2018 ARF; 1975-2017 VMT – Federal Highway Administration's (FHWA) Annual Highway Statistics; 2018 VMT – FHWA's June 2019 TVT



## NHTSA: National Trends by Category, 2018

- **Fatality decreases:**

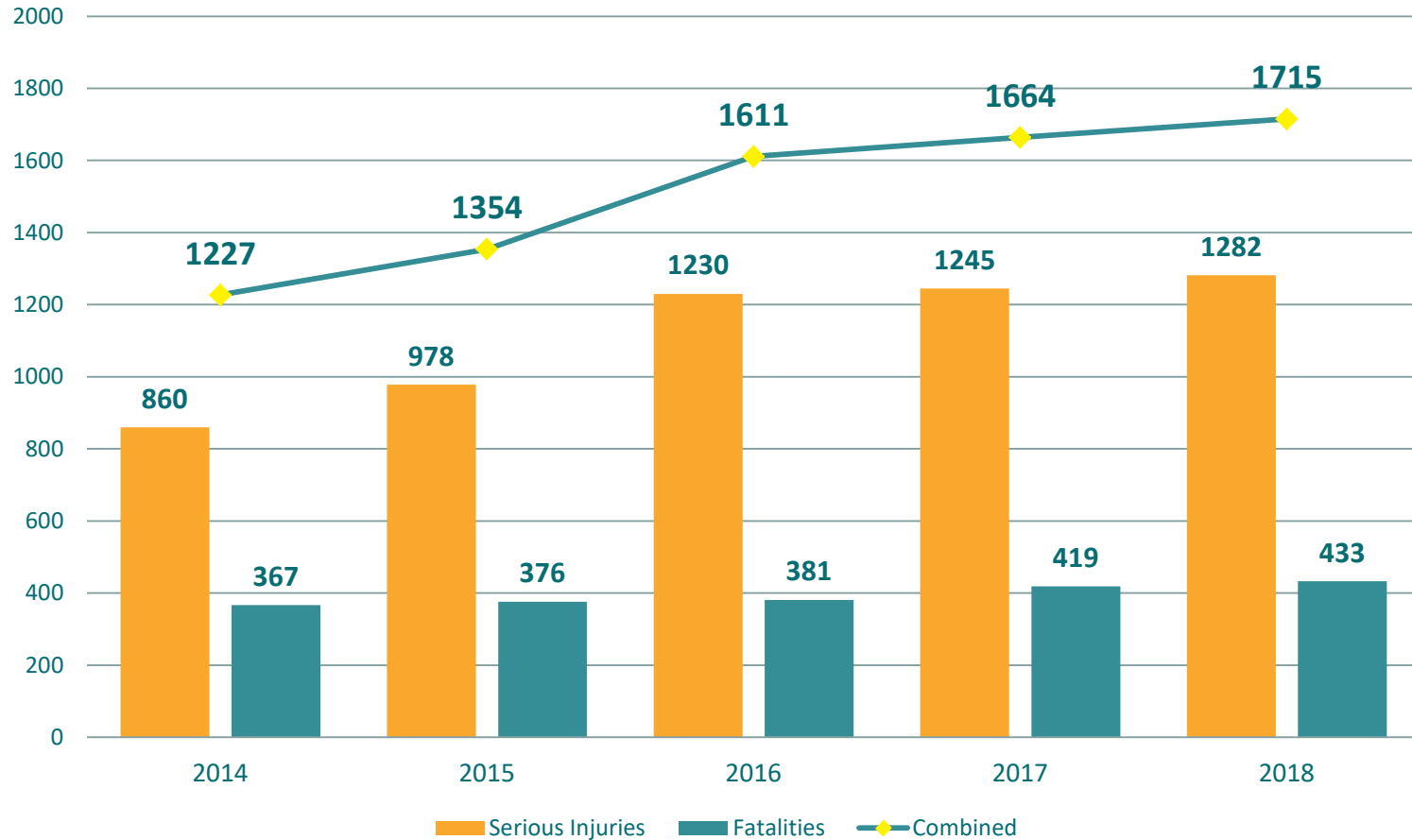
- Occupants 1.6%-8.3% (passenger car, van, SUV, pickup truck)
- Motorcyclists 4.7%
- Speeding-related 5.7%
- Alcohol-impaired 3.6%

- **Fatality increases:**

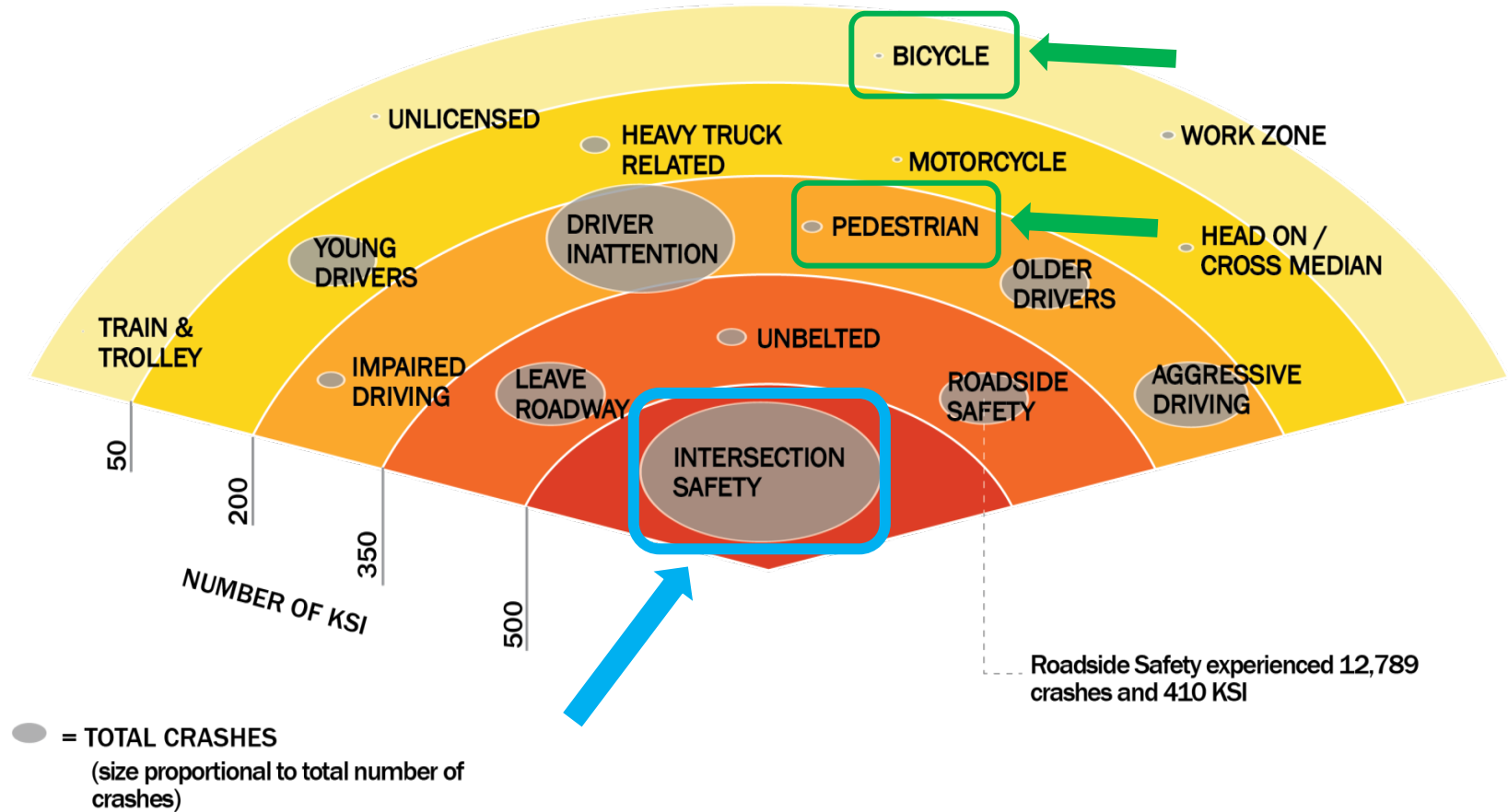
- Pedestrians (208 more fatalities, **3.4%** increase)
- Pedalcyclists (51 more fatalities, **6.3%** increase)

Sources: FARS 1975-2017 Final File, 2018 ARF; 1975-2017 VMT – Federal Highway Administration's (FHWA) Annual Highway Statistics; 2018 VMT – FHWA's June 2019 TVT

# Total KSI - Regional Trend (by person), 2014-2018



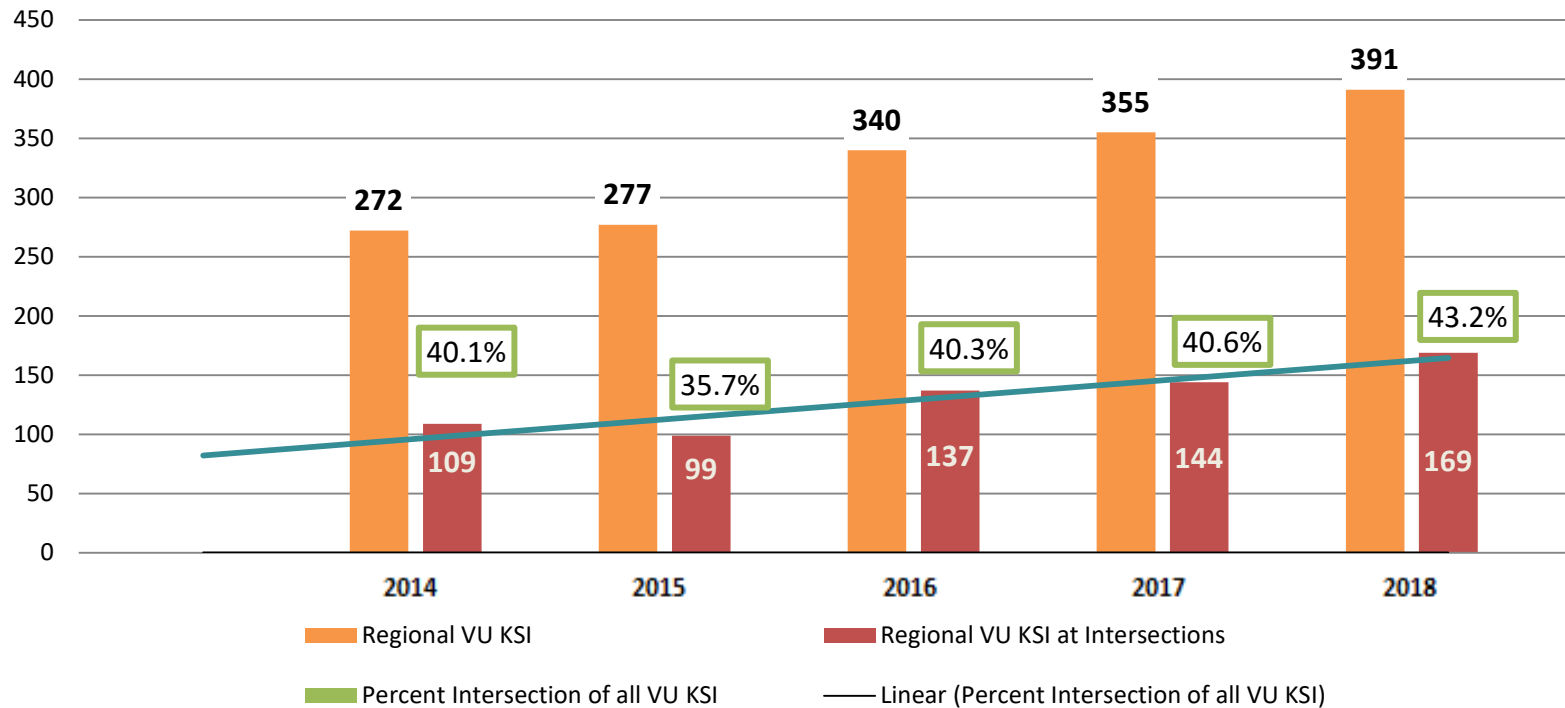
# KSI & Total Crashes by Emphasis Area





# Regional KSI Crash Trend of Bicyclists and Pedestrians (VU) at Intersections, 2014-2018

## VU KSI at Intersections compared to All VU KSI



- **Promote and incentivize the use of FHWA's proven intersection safety countermeasures to local and county roadway owners, (e.g., roundabouts, pedestrian crossing refuge islands, signal back plates with retro-reflective borders), and provide information on funding these improvements. [Education/Engineering]**
- **Promote systemic analysis of intersections and application of pedestrian safety measures (systemic implementation of low cost safety improvements yields high value and consistency). [Engineering]**
- **Promote the benefits of making roadway signage and signalized intersections as clear, simple, and consistent as possible. [Engineering/Education]**
- Work with local officials and roadway owners to evolve our transportation networks to better balance competing needs, prioritizing intersection safety, and managing circulation. [Education/Policy]
- Share engineering best practices for pedestrian safety at intersections, like Continental crosswalks, red light cameras, pedestrian phase signal timing. [Engineering/Education]
- Promote policy that (1) requires every intersection being redesigned be considered for a roundabout, and (2) include a companion piece that ensures consistent signing at roundabouts and education programs to help new users navigate safely and efficiently. [Engineering/Education/Policy]
- Research intersections in the region where innovative pedestrian crossing improvements, like all way stops/Barnes Dance, would be appropriate safety improvements. [Engineering/Education]

# Speakers

## ***Keynote:***

- **Sean Quinn**  
*NYCDOT*

## ***Panelists:***

- **Michael P. Mastaglio, PE, PTOE**  
*Urban Engineers, Inc.*
- **Gustave Scheerbaum**  
*P.E., City of Philadelphia*
- **Matthew Broad**  
*Trenton Health Team*



REGIONAL  
**SAFETY**  
TASK FORCE



**Thank You!**



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# NYC INTERSECTION DESIGN

DVRPC: Regional Safety Task Force

Sean Quinn, Assistant Commissioner

Office of Street Improvement Programs, New York City Department of Transportation

December 6, 2019



# INTERSECTION DESIGN GOALS

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## Bicycle and Pedestrian Intersection Design

### Is it safe?

- » What's the crash rate and severity?
- » Near term: Are there many near misses or other conflicts?

### Is it comfortable?

- » How does this affect behavior? Changes in who's using the facility?
- » How does this relate to empirical safety?

### Is it effective?

- » Are speeds slow?
- » Are people yielding appropriately?
- » Are the sight lines clear?
- » Are conflicts eliminated or minimized?

### Is it intuitive?

- » Are the designs applied consistently and systematically?
- » Are people behaving predictably?

# PROTECTED BIKE LANE INTERSECTION DESIGN

## Typical Treatments in NYC

**Mixing Zone**  
ORIGINAL PBL TOOLKIT



**Fully Split Phase**  
ORIGINAL PBL TOOLKIT



**Delayed Turn (AKA Split LBI)**  
Pilot treatment, not in widespread use



**Offset Crossing**  
Pilot treatment, not in widespread use



# PROTECTED BIKE LANE (PBL): INTERSECTION DESIGN

## Typical Treatments in NYC

### Mixing Zone

ORIGINAL PBL TOOLKIT



### Fully Split Phase

ORIGINAL PBL TOOLKIT





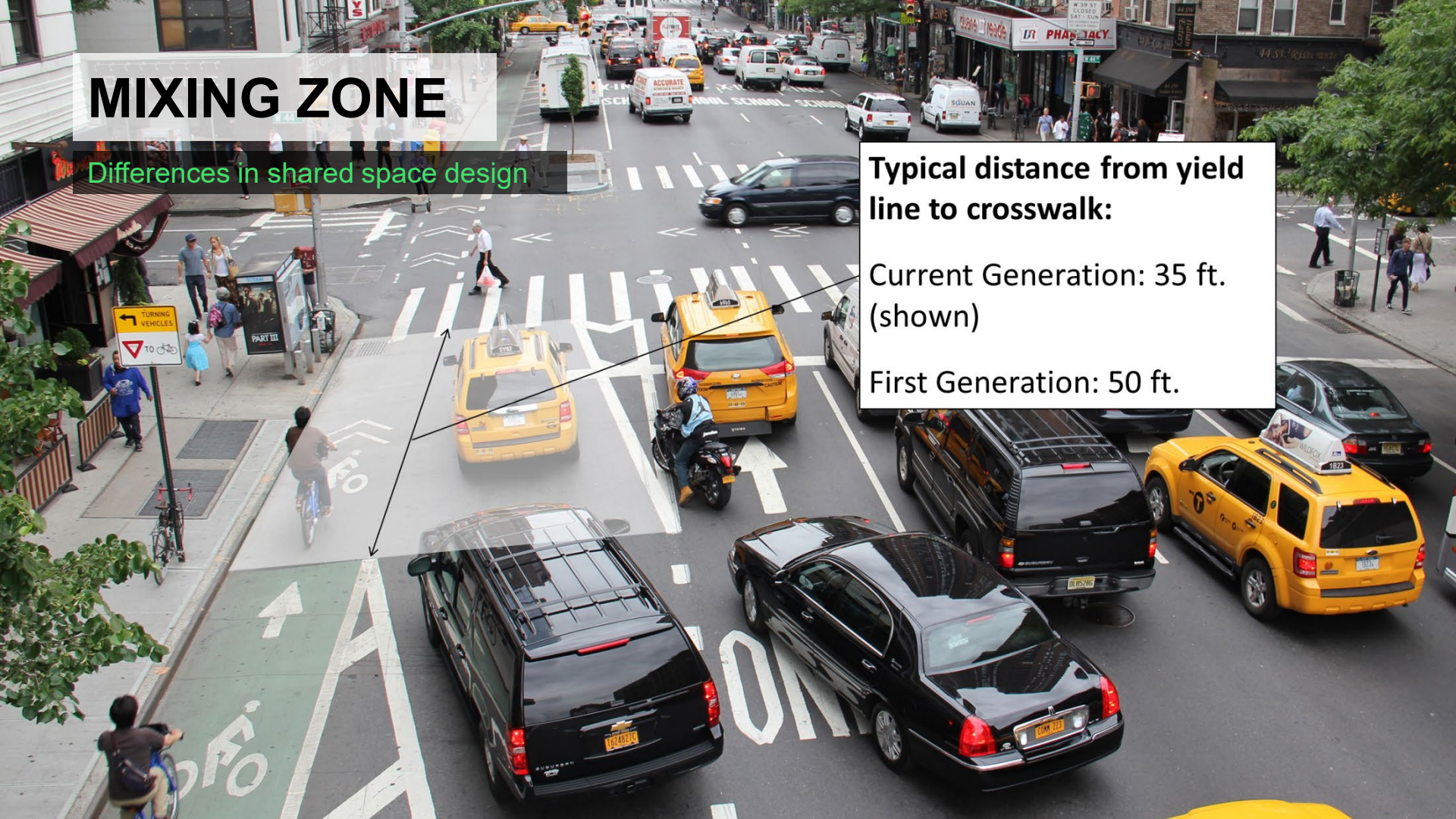
# MIXING ZONE

Differences in shared space design

Typical distance from yield line to crosswalk:

Current Generation: 35 ft.  
(shown)

First Generation: 50 ft.

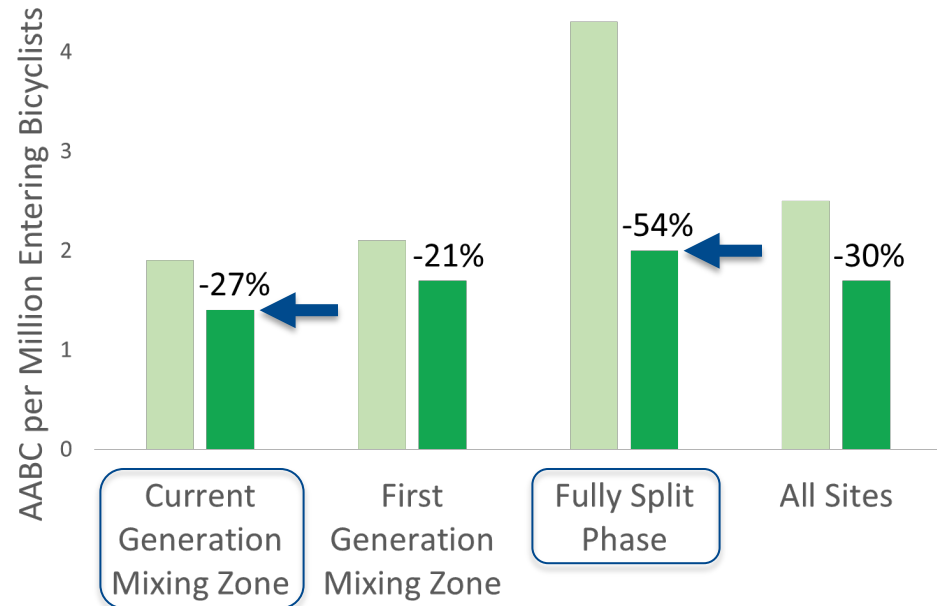


# PROTECTED BIKE LANES

## Intersection Study: Crash Rates

- » **↓30%** reduction of intersection bicycle crashes per cyclist following PBL installation
  - Split phase has a lower crash rate at wider intersections
- » Need to balance comfort, safety and mobility

Average Annual Bicyclist Crashes (AABC)  
per Million Entering Bicyclists  
before and after PBL Installation



Source: Cycling at a Crossroads:  
The Design Future of New York City Intersections



# OFFSET CROSSING

Treatment overview

Floating  
Parking

Yield zone  
for turning  
drivers

“Truck apron”  
turn wedge w/  
speed bump

Advanced  
stop

Pedestrian  
Island



# OFFSET CROSSING

Street resurfacing retrofits

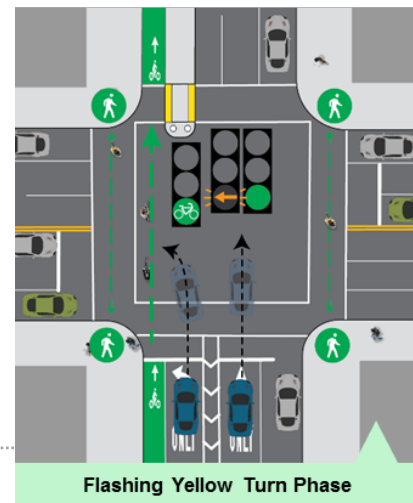
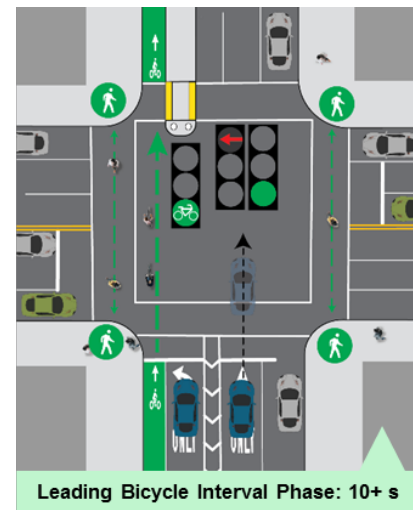
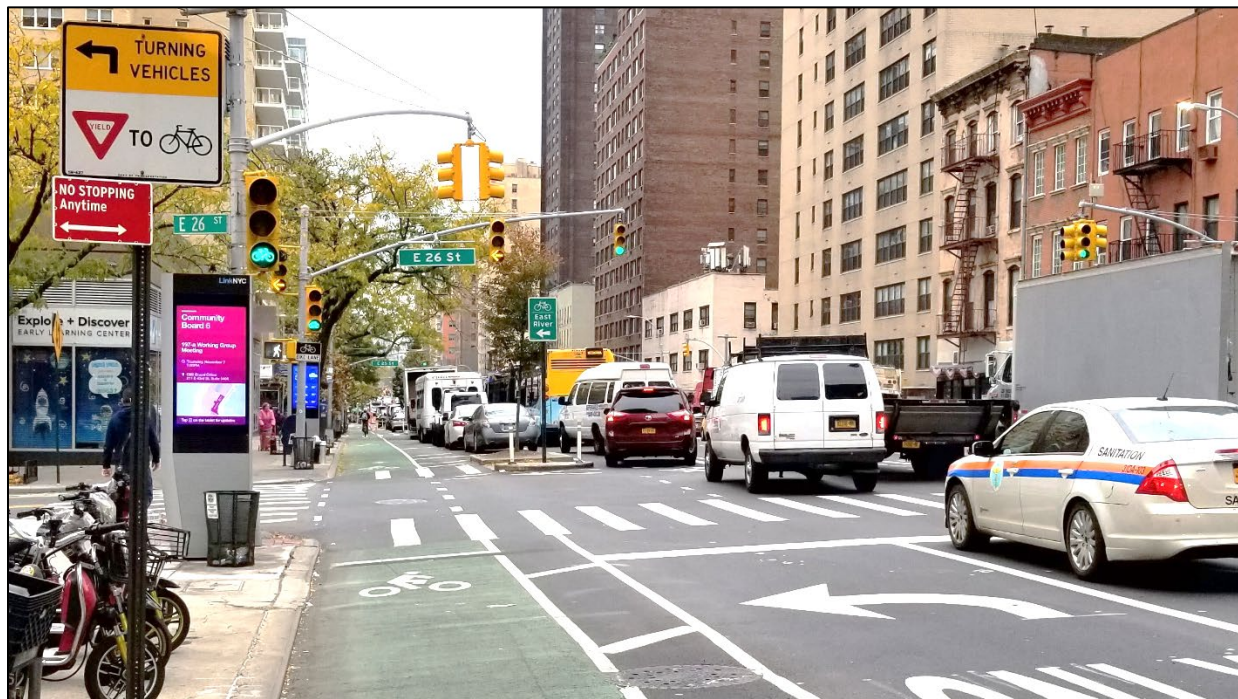


Before: Mixing Zone



# DELAYED TURN (SPLIT LBI)

Pilot treatment used under specific conditions







# 4 TO 3 CONVERSION

BEFORE



AFTER



# MULTI LANE ONE WAY CORRIDOR





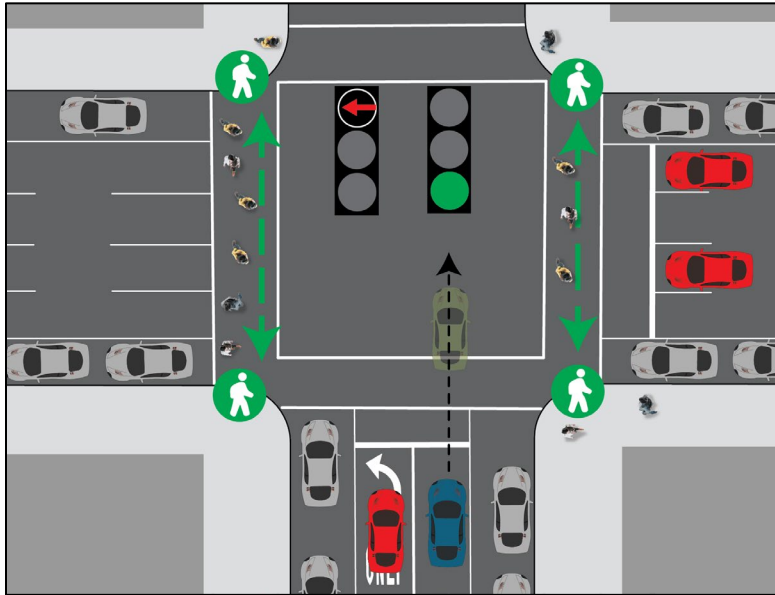
# SIMPLIFIED INTERSECTION

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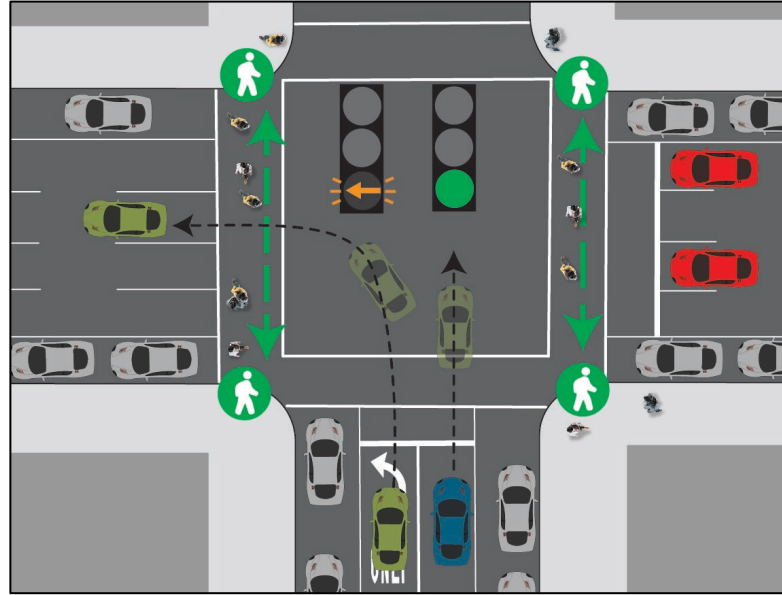


# TURN CALMING

## Delayed Turn (Split LPI)



Leading Pedestrian Interval Phase (7+ secs)

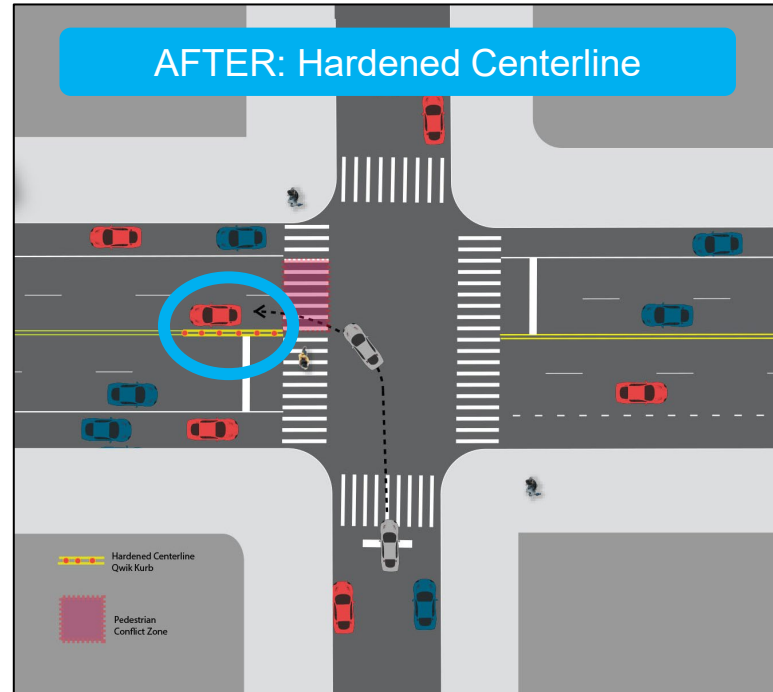
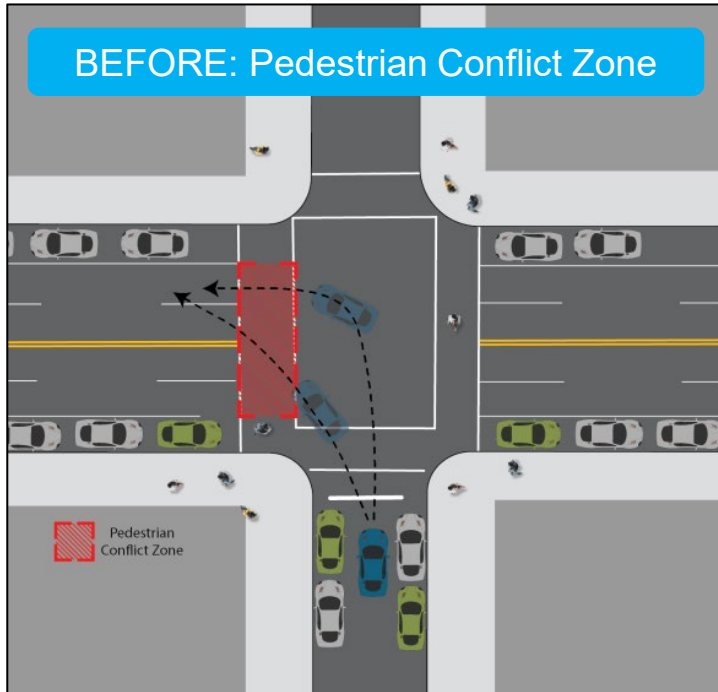


Flashing Yellow Turn Phase



# TURN CALMING

## Left-Turn Traffic Calming, Hardened Center Line



# LEFT TURN TRAFFIC CALMING



# LEFT-TURN TRAFFIC CALMING

## Evaluation results

- » Median turn speeds ↓24%
- » Vehicles crossing Double Yellow Line ↓98%
- » Some durability issues:
  - Speed bumps are being tested to protect treatment elements





# PUTTING IT ALL TOGETHER

Full Toolkit: Lincoln Center



**BEFORE**



# PUTTING IT ALL TOGETHER

Full Toolkit: Lincoln Center

**AFTER**





# OTHER RECENT INTERSECTION ADVANCEMENTS

## » Signal improvements

- Bikes may use LPI law
- Corridor signal progressions timed to cyclist speeds

## » “Green Wave” bicycle master plan

## » Design guidance updates

- Further evaluation on safety, treatment materials, preferences, behavioral, and operational effects.



# THANK YOU!

Discussion



NYCDOT



nyc\_dot



nyc\_dot



NYCDOT



# Walking in Circles: Pedestrian & Bicycle Safety at Roundabouts

Michael P. Mastaglio, PE, PTOE  
Urban Engineers, Inc






# Roundabout Characteristics

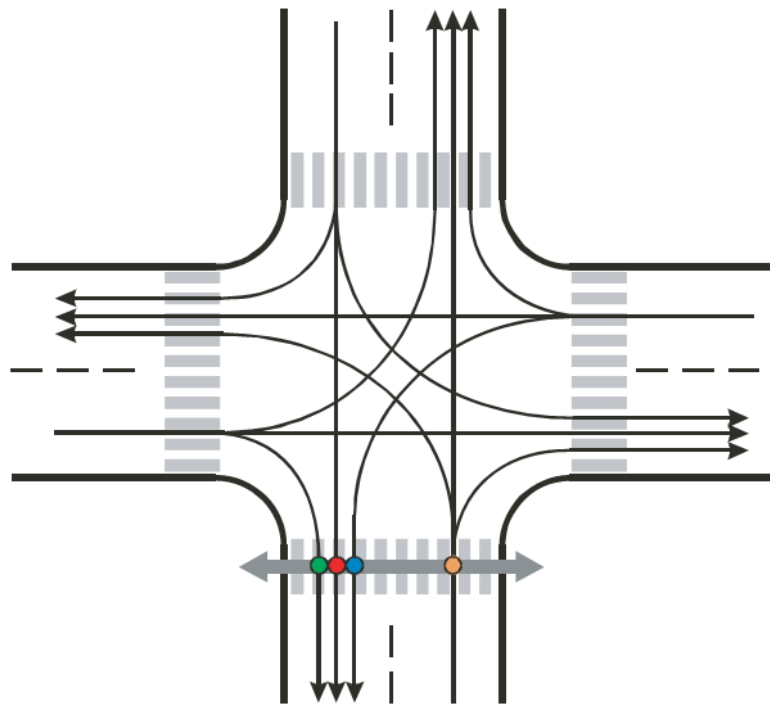
## Roundabouts Vs. Traffic Circles and Rotaries

Many folks believe that the circular intersections they have experienced in the eastern portion of the United States are modern roundabouts. This is simply not true. For those travelers who have only encountered old-style traffic circles, it is important to understand why modern roundabouts move traffic safely and efficiently. There are major differences between the modern roundabout and the old style traffic circle or rotary.

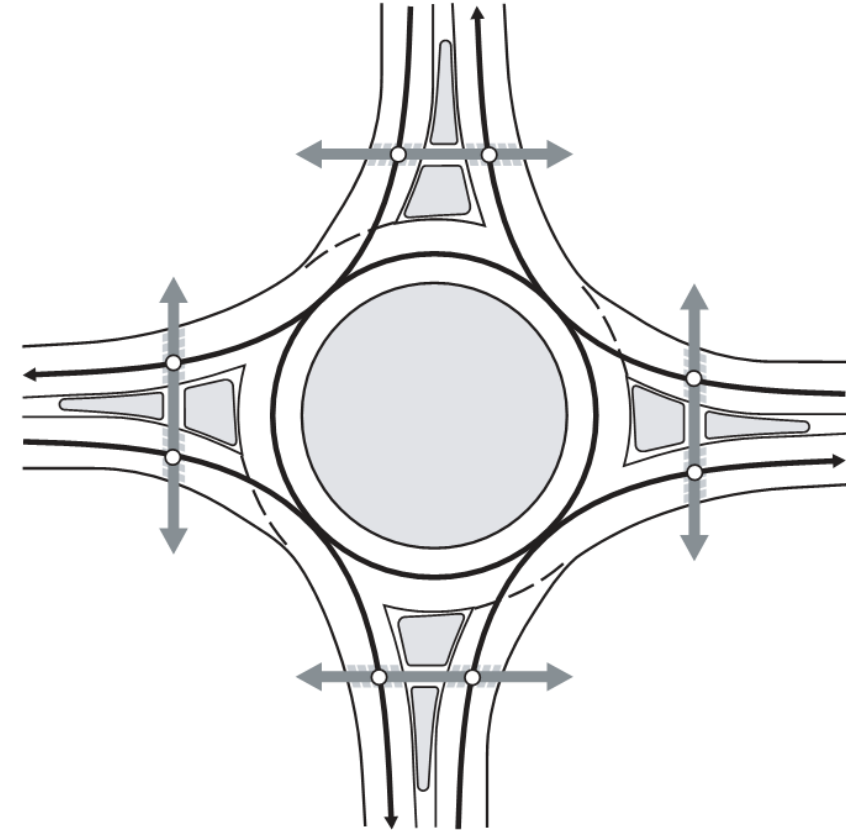
There are three principals that explain the superiority of modern roundabouts over the old traffic circles: yield rules, deflection, and flare.

| Roundabouts   |  | Traffic Circles  |
|---|--|--|
| <p><b>Yield-at-Entry Rule:</b></p> <ul style="list-style-type: none"> <li>• Entering traffic yields to circulating traffic, which always keeps moving.</li> <li>• Very efficient with heavy traffic.</li> <li>• No weaving distance is needed, so roundabouts are small and fit in compact spaces.</li> </ul>           | <p><b>YIELD</b></p>       | <p><b>Entering traffic may interfere with circulating traffic:</b></p> <ul style="list-style-type: none"> <li>• Circulating traffic can not clear when entering traffic fills circle.</li> <li>• Heavy traffic causes gridlock.</li> <li>• Circles must be large to provide long weaving distances.</li> </ul> |
| <p><b>Entering traffic is deflected slowly around the central island:</b></p> <ul style="list-style-type: none"> <li>• Deflection controls speed without enforcement, thereby reducing accidents.</li> <li>• Deflection forms gaps in traffic so other vehicles can enter.</li> <li>• Entry flare adds lanes</li> </ul> | <p><b>DEFLECTION</b></p>  | <p><b>Inconsistent entry design may allow traffic to enter at high speed:</b></p> <ul style="list-style-type: none"> <li>• Serious accidents can result on high speed streets.</li> <li>• Fast entries impede gap acceptance and defeat the yielding process.</li> </ul>                                       |
| <p><b>Flare increases capacity at the intersection, where capacity is needed most:</b></p> <ul style="list-style-type: none"> <li>• Flare promotes narrow streets between roundabouts, saving cost and neighborhood impacts.</li> </ul>   | <p><b>FLARE</b></p>     | <p><b>Poor entry conditions may not benefit from flare:</b></p> <ul style="list-style-type: none"> <li>• Poor intersection capacity even with large traffic circles.</li> <li>• Higher capacity requires wide streets between circles, wasting money and land</li> </ul>                                       |

# Conflicts at Intersections



- Right turn on green conflict
- Red light running conflict
- Left turn on green conflict
- Red light running or right turn on red conflict



○ Vehicle/Pedestrian Conflicts

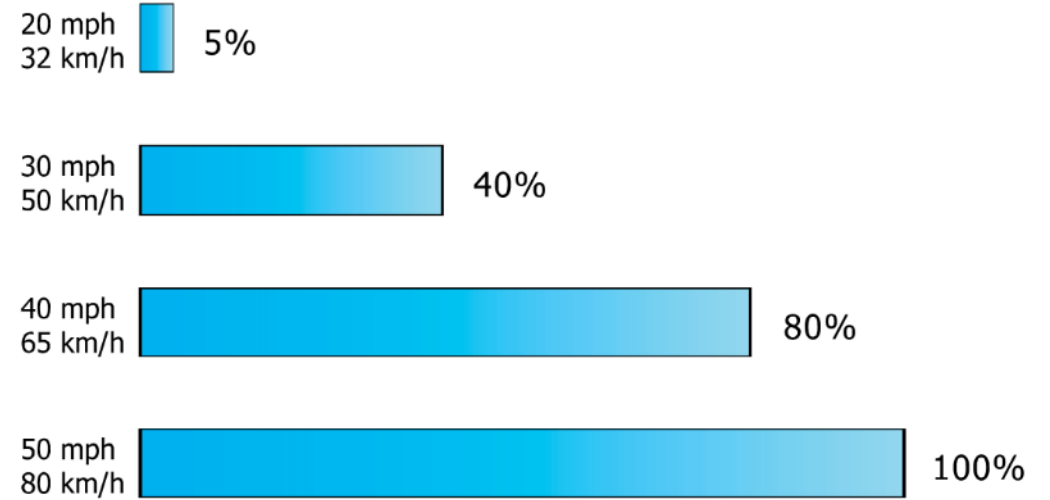
Source: NCHRP Report 672, 2<sup>nd</sup> Edition



# Speed Kills

## Slower speeds:

1. Increase survivability
2. Decrease required stopping sight distance
3. Increase likelihood of yielding
4. Decrease severity of potential collisions



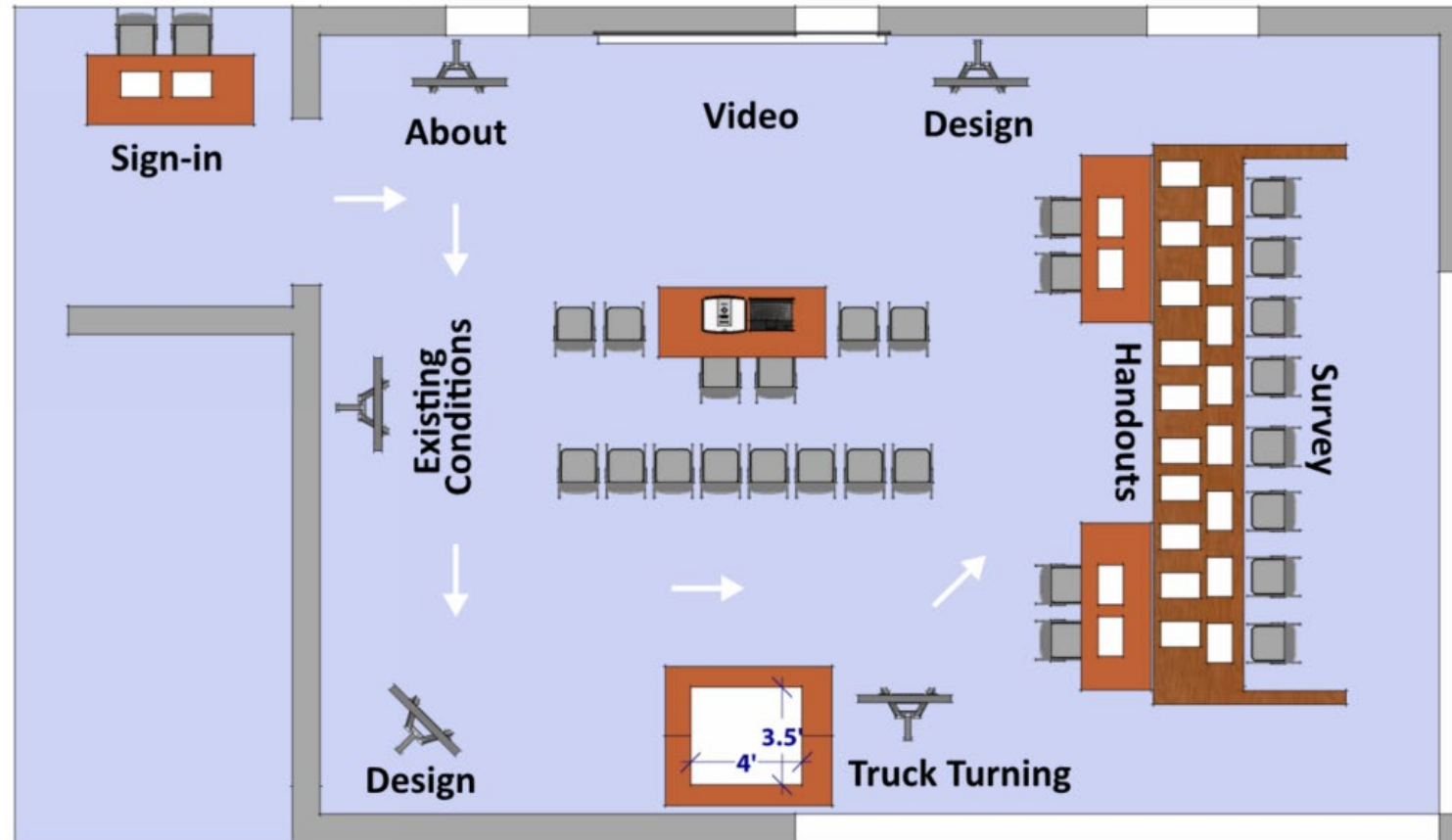
## Chance of Pedestrian Death If Hit by a Motor Vehicle

| Site Category   | Recommended Maximum Theoretical Entry Design Speed |
|-----------------|--|
| Mini-Roundabout | 20 mph (30 km/h)                                   |
| Single Lane     | 25 mph (40 km/h)                                   |
| Multilane       | 25 to 30 mph (40 to 50 km/h)                       |

Source: NCHRP Report 672, 2<sup>nd</sup> Edition

# Public Education is Key to Roundabout Success

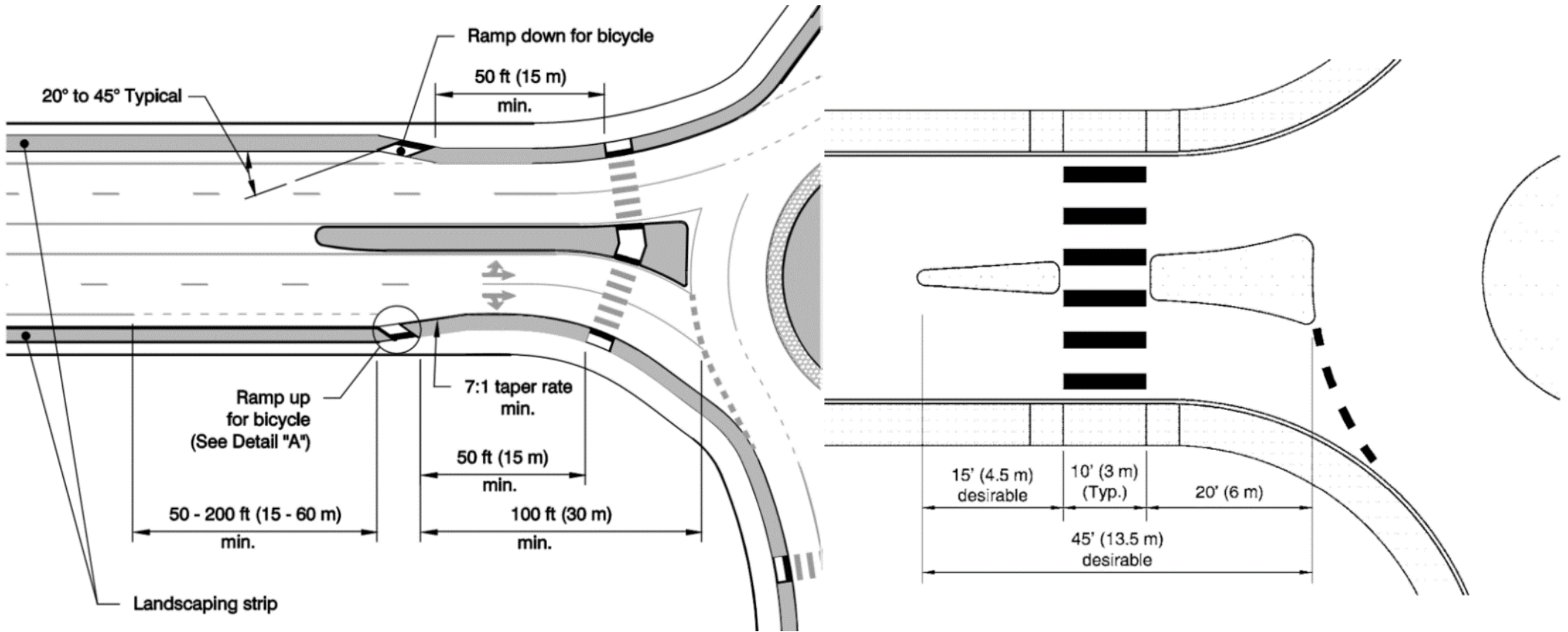
Room Layout







# Pedestrian and Bicycle Crossings at Roundabouts

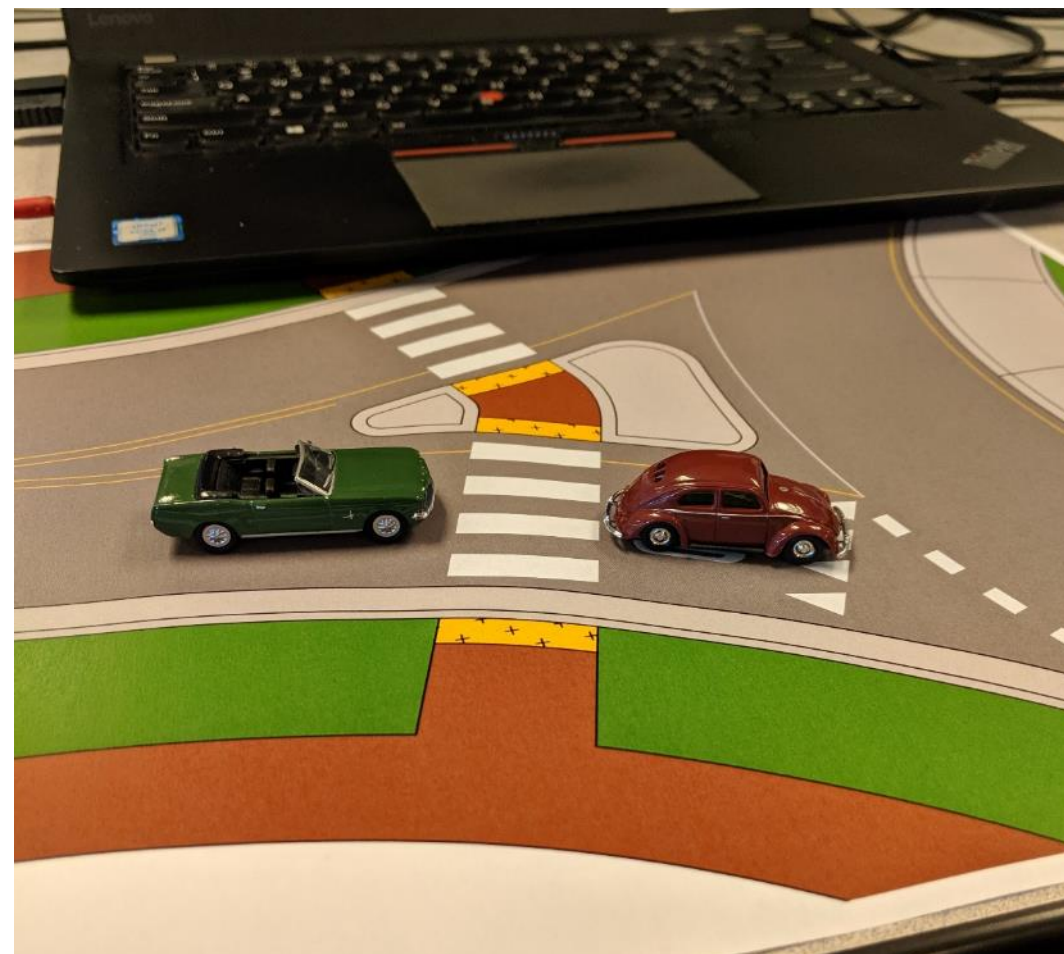


Source: NCHRP Report 672, 2<sup>nd</sup> Edition

Source: FHWA Mini-Roundabouts – FHWA-SA-10-007

# Pedestrian Crossings at Roundabouts

- Crosswalks setback one car length
- Separates conflicts between cars and pedestrians
- Allows pedestrians to cross when cars are queued



Source: Andrew Thompson

# Portzer Road – Richland & Milford Townships





# Districtwide Roundabout Program

Bucks
c87397.pdf
1/1

BUCKS - 4

#1-87397: OLD YORK RD (263) & BUCKINGHAM RD (202)

**OLD YORK RD (263) & BUCKINGHAM RD (202)**  
BUCKINGHAM, PA SR: 202

24 Crashes 11 Angle, 0 Head-On 19,451 AADT

| Killed | Major | Moderate | Minor | Unknown | Not Inj. |
|--------|-------|----------|-------|---------|----------|
| 0      | 0     | 1        | 5     | 5       | 13       |

| Severity Cost (Sum) | Severity Cost (AVG) | Crash Rate |
|---------------------|---------------------|------------|
| \$712,413           | \$29,684            | 0.67611    |

Pedestrians - 0 Cyclists - 0

Crash Lists - HSNS Rural Seg, HSNS Rural Int, Linear Cluster, Point Cluster

Possible Candidate suggested by Bucks County to PennDOT in July 2019

GIS Image

Street View

Concept

Map

#2-89820: MINSI TR & SOUDERTON RD

#3-90316: DIAMOND ST & MAIN ST

#4-82501: SAW MILL RD & SWAMP RD

Site created by Urban Engineers, Inc.  
Email the consultant project manager.



# Dutch Intersections

- Protected
- Dedicated  
bypass
- Reduced  
distan



# Bike-Bus conflict near roundabouts



**Gus Scheerbaum**  
@GScheerbaum



Separated bike lane at modern roundabout approach with bus stop on Borgartun, Reykjavik.





# Thank you

Contact:

**Michael P. Mastaglio, PE, PTOE**

Urban Engineers, Inc

[mpmastaglio@urbanengineers.com](mailto:mpmastaglio@urbanengineers.com)

(215) 922-8080



# WHEN A PERSON IS HIT BY A DRIVER AT...



1 OUT OF 10 DIE



5 OUT OF 10 DIE



9 OUT OF 10 DIE

*Slowing down saves lives.*

# VZ principles to priorities

---

- Evaluation/data
- **Engineering**
  - *Geometric elements of the intersection will be changed (re-engineered) to slow traffic, forcing all users to be more aware of their place on the road.*
- Enforcement
- Education / Engagement



# Broad & Chestnut Modified Intersection





**BEFORE**



**AFTER**







# Frankford-Trenton-York Intersection

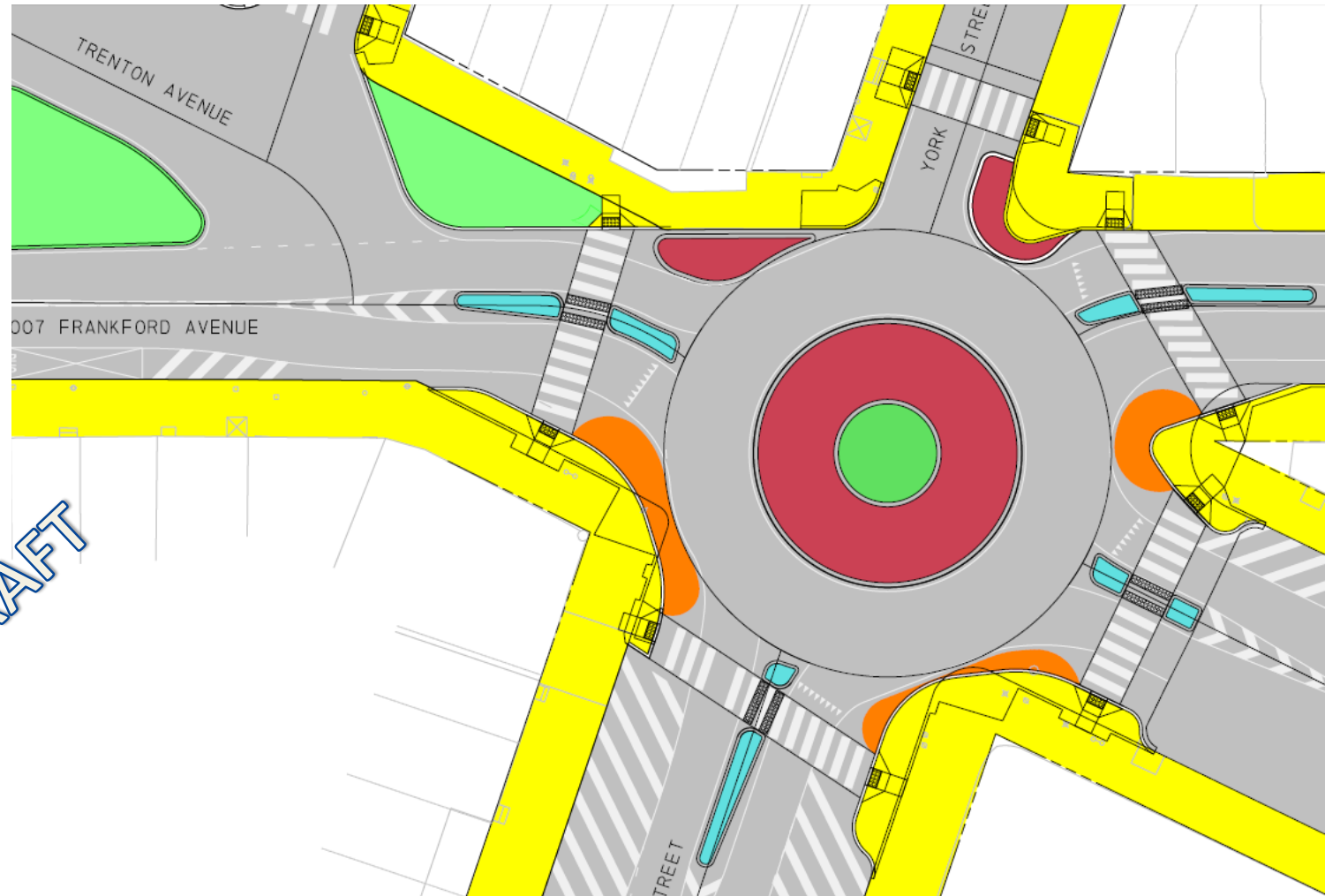
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# Frankford-Trenton-York Modern Roundabout

- LEGEND**
-  **SIDEWALK**
  -  **ROADWAY**
  -  **MOUNTABLE APRONS**
  -  **TEXTURED CONCRETE**
  -  **SPLITTER ISLANDS**
  -  **GRASS AREAS**

DRAFT







COMCAST CENTER

xfinity

LANES SHIFT AHEAD

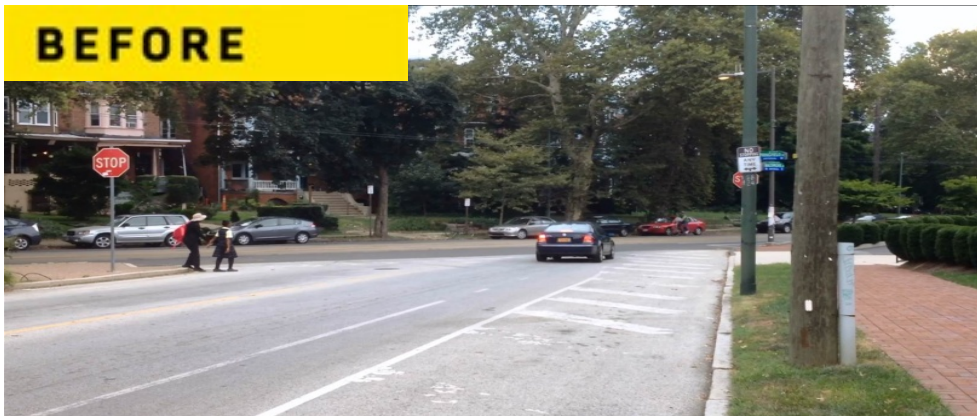
STATE LAW  
STOP  
FOR  
WITHIN  
CROSSWALK

LANE SHIFT AHEAD



# Springfield & Baltimore – Curb Extensions

**BEFORE**



**AFTER**



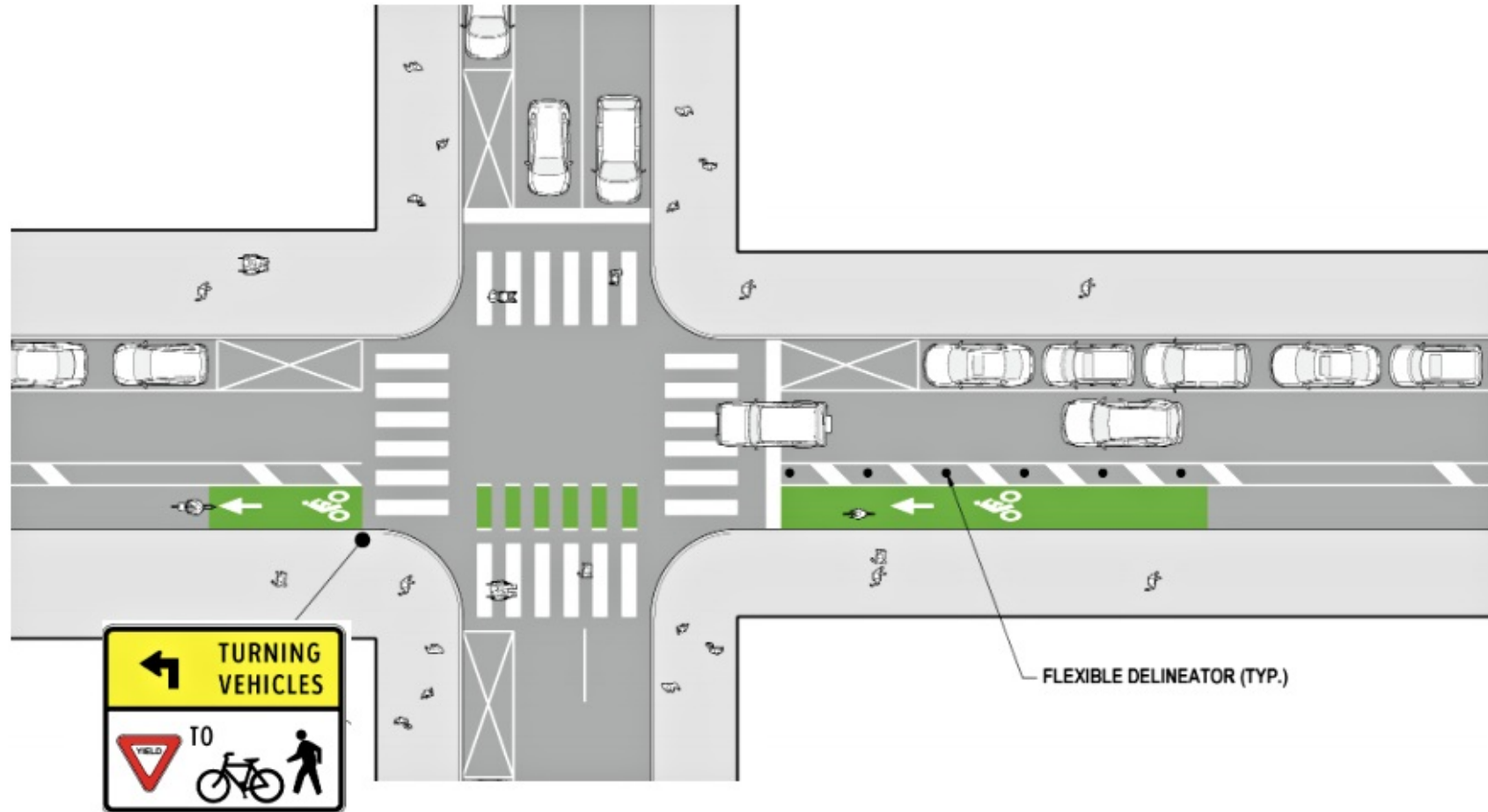
“The response in the neighborhood has been phenomenal! There has been an outpouring of appreciation; especially nice for a project of this scale.”

- University City District re.  
Springfield & Baltimore

“We have seen a major decrease in vehicle / bicycle / pedestrian crashes.”

- Superintendent Penn Police re.  
38<sup>th</sup> & Spruce

# Spruce – Pine Bike Lanes Revisited







**BEFORE**






**AFTER**





Thank you...

Gustave Scheerbaum, P.E.  
Director, Strategic Initiatives  
Department of Streets  
[gustave.scheerbaum@phila.gov](mailto:gustave.scheerbaum@phila.gov)  
 [@GScheerbaum](https://twitter.com/GScheerbaum)



# Trenton Transformation: A Safe and Health Corridor

This collaborative initiated a “Safe & Healthy Corridor” along Brunswick Avenue to improve the environment within Trenton’s North Ward. The goal is to create a public space where people feel safe—where residents and visitors are comfortable walking, biking, exercising, and interacting with others—thereby improving physical and mental health and generating a sense of community well-being. Aligning with other city initiatives, current aims include city revitalization and development of green spaces, fostering nutrition and active living in local schools, and supporting healthy food access through a new farmers market within the corridor.





# Challenges: Neglected Streets and Perception of Safety





# Building our Complete Streets Team





# Brunswick Ave Demonstration Project: Before





# Brunswick Ave Demonstration Project: During





# Brunswick Ave Demonstration Project: After





# Thank You!

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Photo Credit: Adam Nawrot

Matthew Broad, MPH  
Community Health and Wellness Manager  
Email: [mbroad@trentonhealthteam.org](mailto:mbroad@trentonhealthteam.org)

[www.trentonhealthteam.org](http://www.trentonhealthteam.org)



RSTF 2020

FOCUS ON

# SAFETY CULTURE



 **dvrpc**

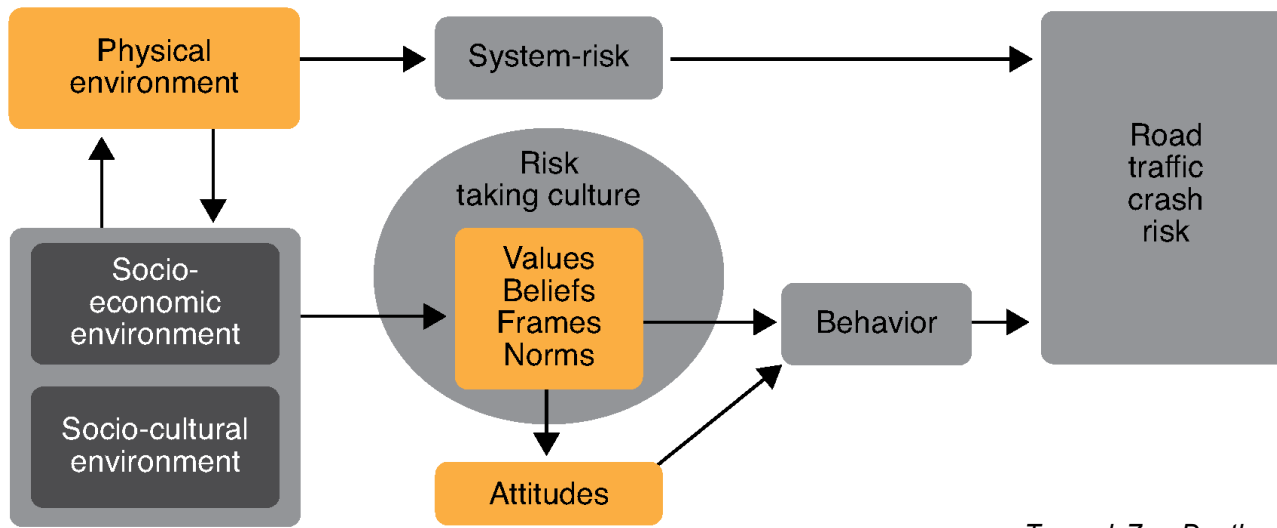
DELAWARE VALLEY  
 **dvrpc**  
REGIONAL  
PLANNING COMMISSION

CONNECT WITH US! @DVRPC #RSTF #VISIONZERO



# What is Traffic Safety Culture?

- How **organizations** and **society** view crash risk and prioritize safety in decision-making
- Decisions are dictated by societal **values, beliefs, and norms**



*TowardsZeroDeaths.org*

# RSTF 2020 Goals

- Build a better understanding of the traffic safety culture framework
- Identify how it impacts our own work as RSTF members
- Identify where it impacts other, non-transportation sectors
- Strategize how to shift traffic safety culture in the region





**Words matter in saving lives.**

<https://visionzeronetwork.org/crashnotaccident-words-matter-in-saving-lives/>

# March 2020

- What is *Traffic Safety Culture*?
- How can transportation safety professionals improve the traffic safety culture in the region?





# June 2020

- How does the way the media reports crashes influence societal attitudes toward traffic safety?
- What role can the media play in shifting the narrative around crashes and traffic safety?



# September 2020

- How do laws and our justice system treat traffic safety?
- How can the justice system better promote safety culture?





# December 2020

- How is traffic safety viewed in the health sector?
- How can the health and transportation sectors learn from one another and collaborate to better promote safety culture?

