

Overview of Modern Roundabouts

Benefits, Opportunities, and Challenges



Mark T. Johnson, PE
608.238.5000
www.mtjengineering.com

Study Session

Presentation Outline

- Development of Modern Roundabouts
- Variety of Applications
 - Implementation in many different conditions
- Safety
- Pedestrians and bikes
- Emergency Response / Trucks/freight,
- Traffic Planning Opportunities/Benefits
 - Reduced Impacts and Costs
 - Improved business access and circulation
- Public Involvement
 - Case Studies



INTRODUCTION

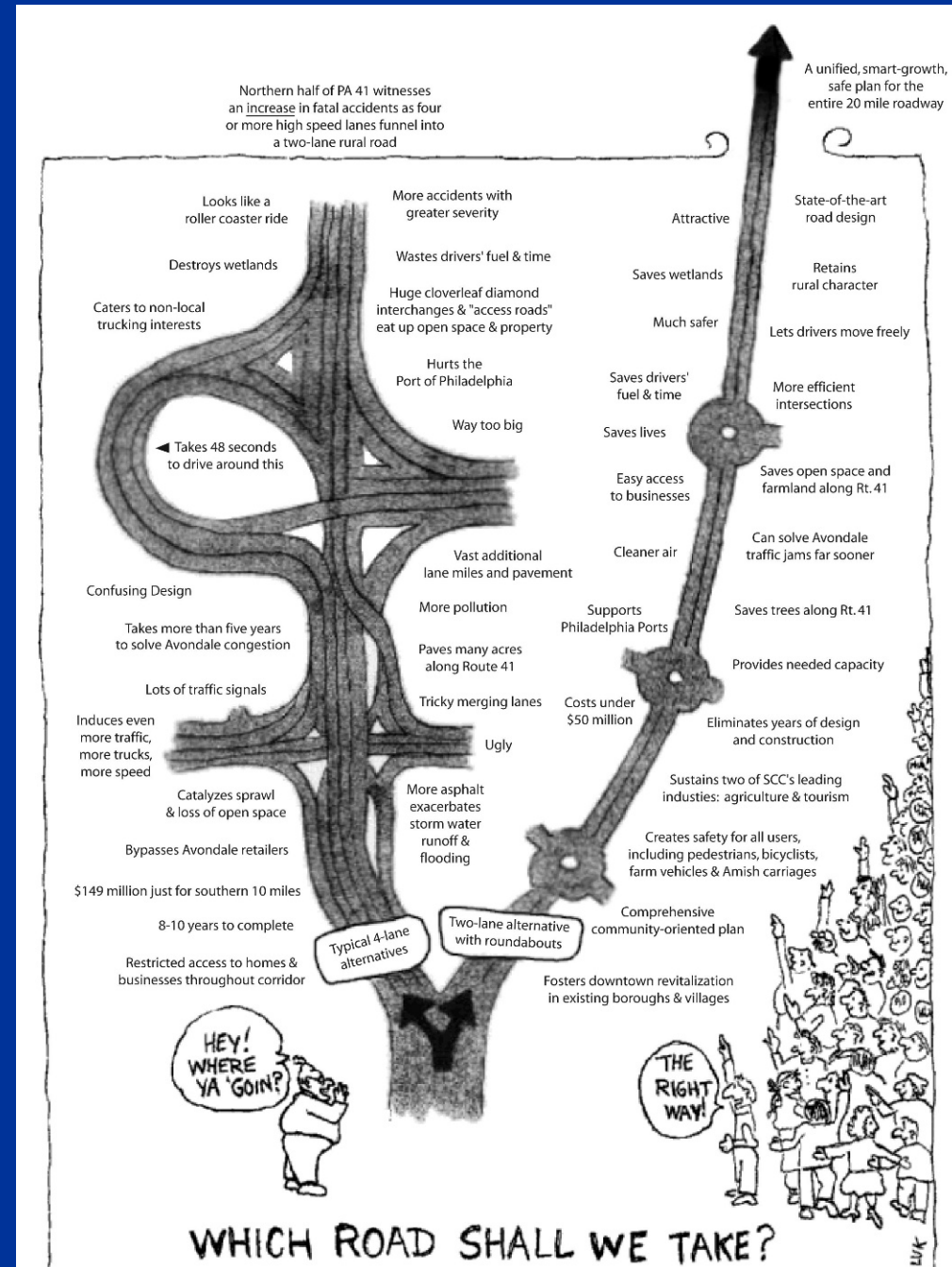
Roundabout vs Signals?

- Evaluate Alternatives

- Costs
- Impacts
- Operational (all modes)

- Benefits / Costs Analysis

- Achieve Community Objectives



Development of Modern Roundabout

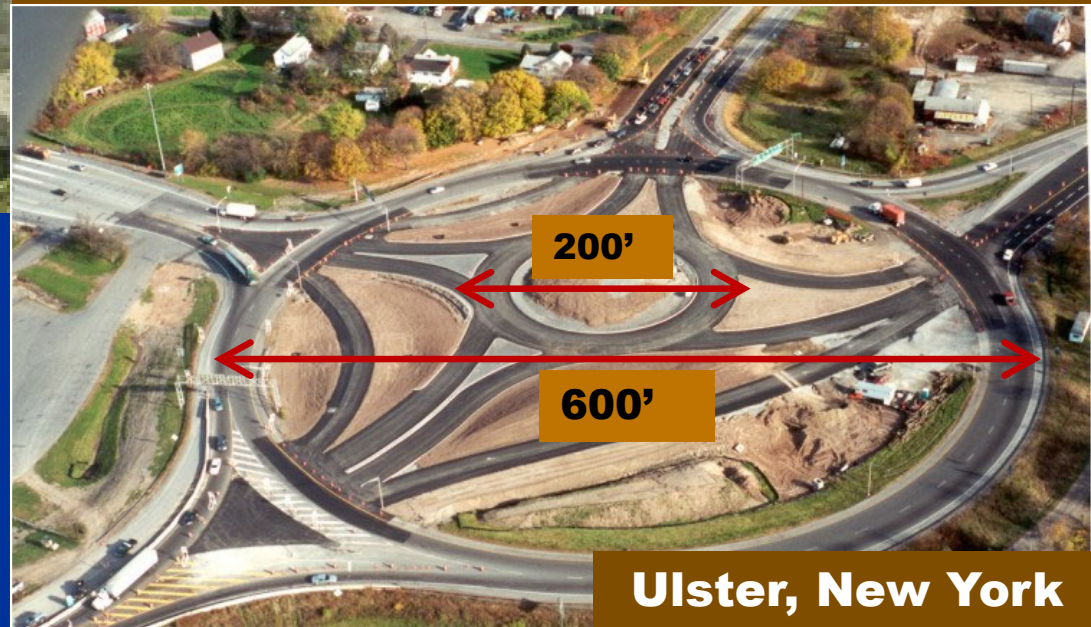


Development of Modern Roundabout



L'Arc de Triomphe

U.S. Built 'Rotaries' 1930's-1950's



Ulster, New York

Development of Modern Roundabout

1960-70s congestion relief was a national imperative in the UK

U.K. did not abandon...70 million

**All sizes and shapes...
many “Grid Locked”**

**1966 – “Yield at Entry Rule”
Eliminated “Locking”
First Step to “Modern”**

UK Continued Research...



Development of Modern Roundabout

UK Research

Significant design research and experimentation was conducted

Track Experiments



Track Experiments

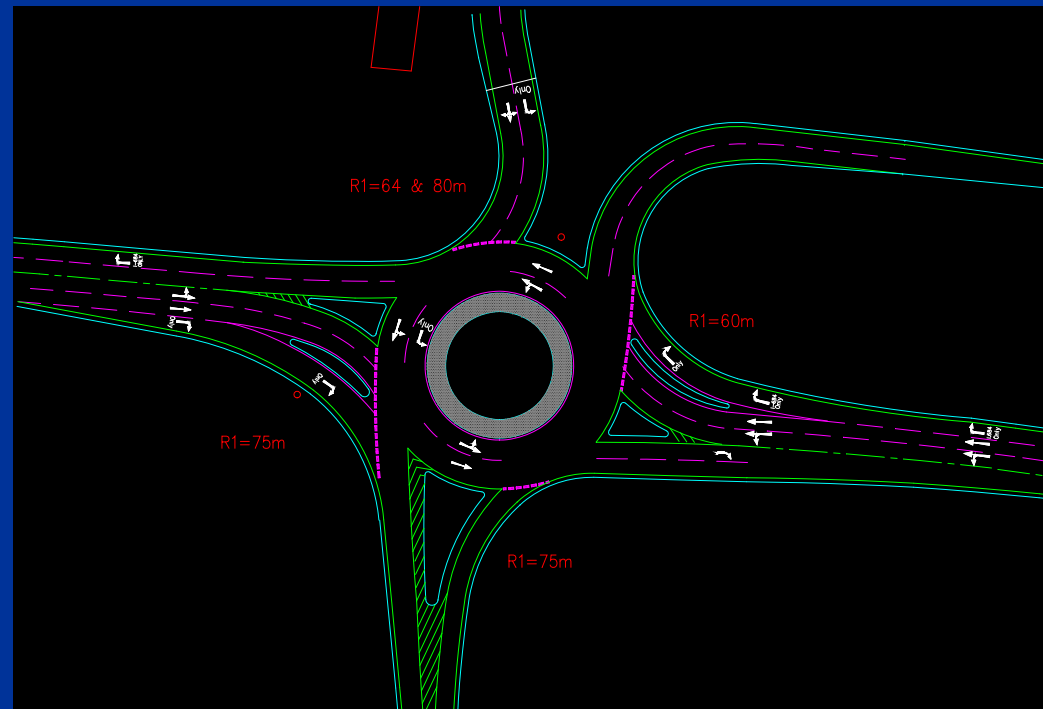


Modifications to large congested roundabouts

Development of Modern Roundabout

1980 Published Improved Roundabout Design Methodology

**Other countries began implementing M.Rndbts in 1980's
First U.S. "Modern" Roundabouts 1990's...**



Wide Variety of Applications



Roundabout Applications



Cultural / Public Art

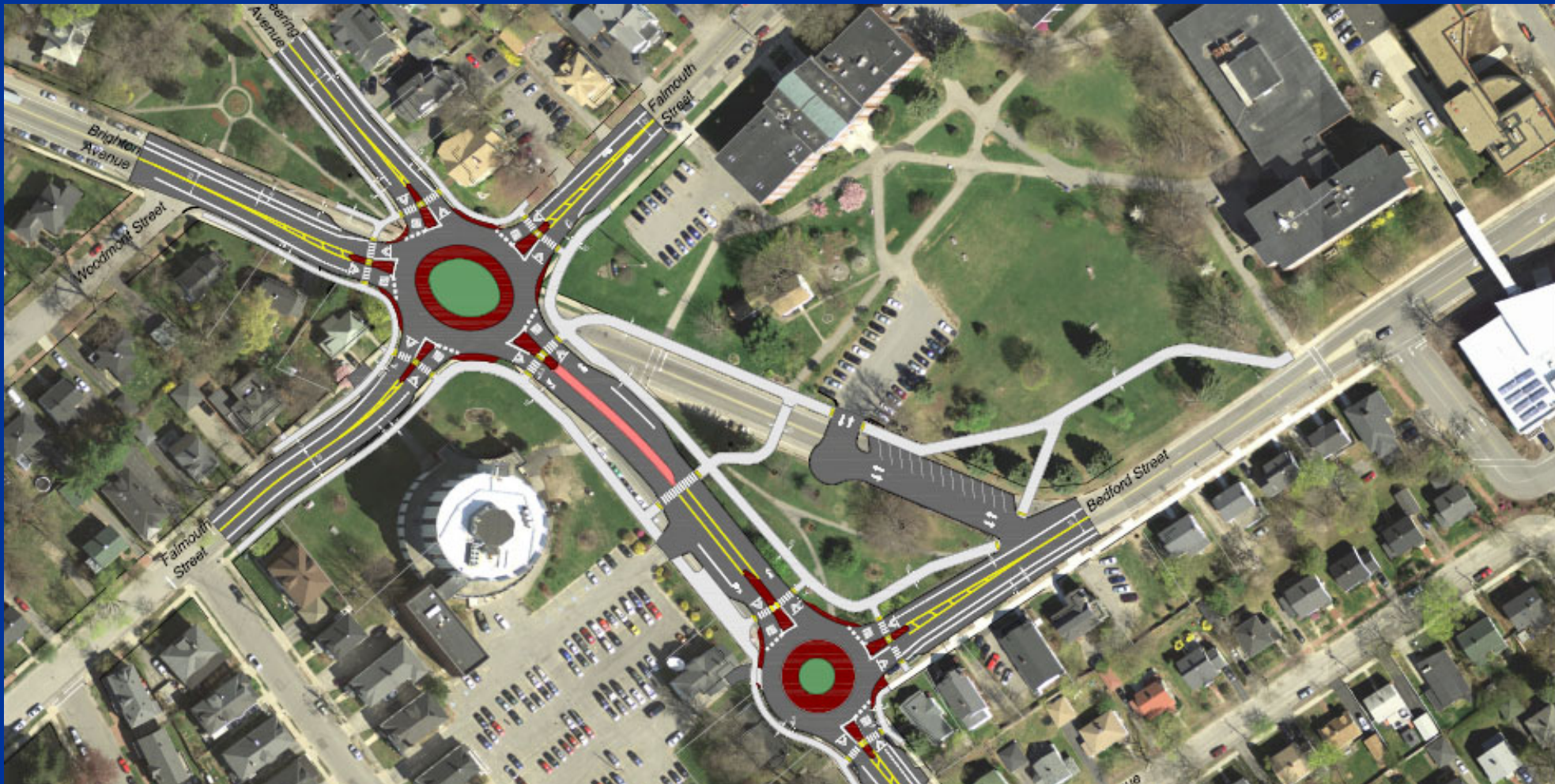


Historic Districts



Economic Development

Roundabout Applications



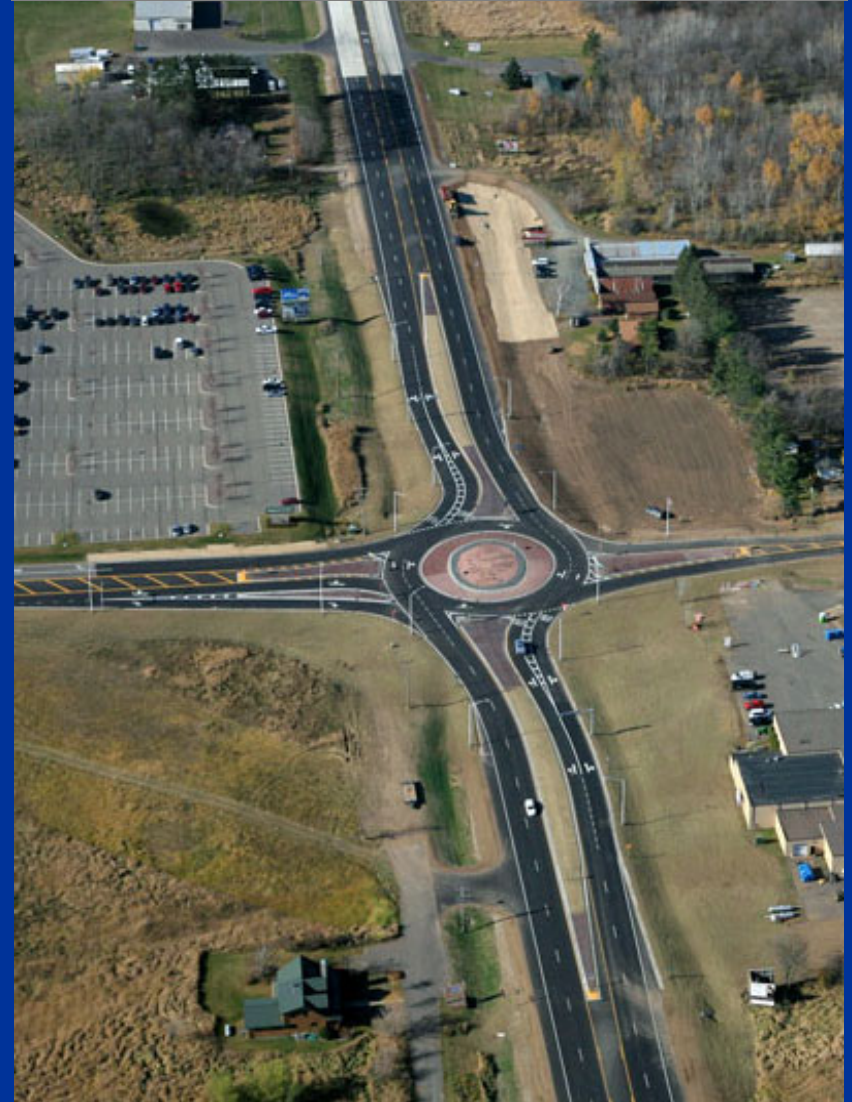
Campus Revitalization Southern Main University, Portland Maine

Roundabout Applications

Transitional



High Speed 4 Lane Divided



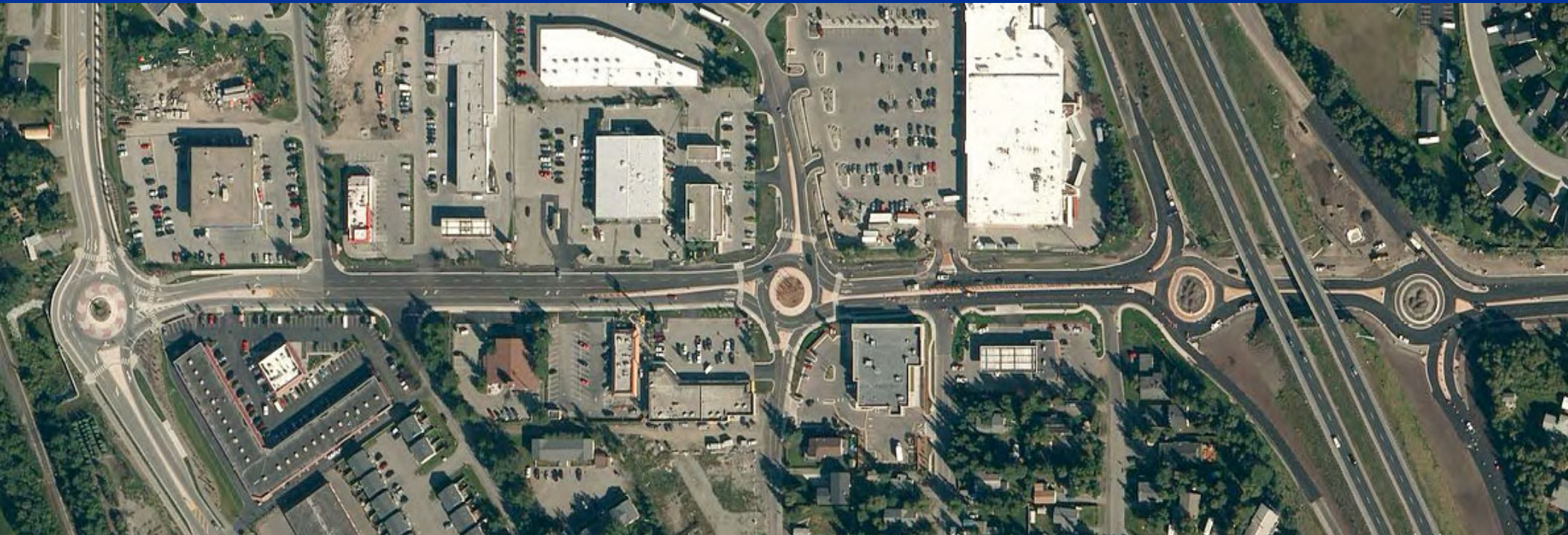
High Speed Approach

Roundabout Applications

Interchange



Roundabout Applications



Huffman Road Corridor, Anchorage, AK - No Roadway Widening (3 Lanes)

Safety



Annual US Intersection Safety Statistics

8-9,000 fatalities

1.5 million people injured

Pedestrian fatal = 1,131, 24%

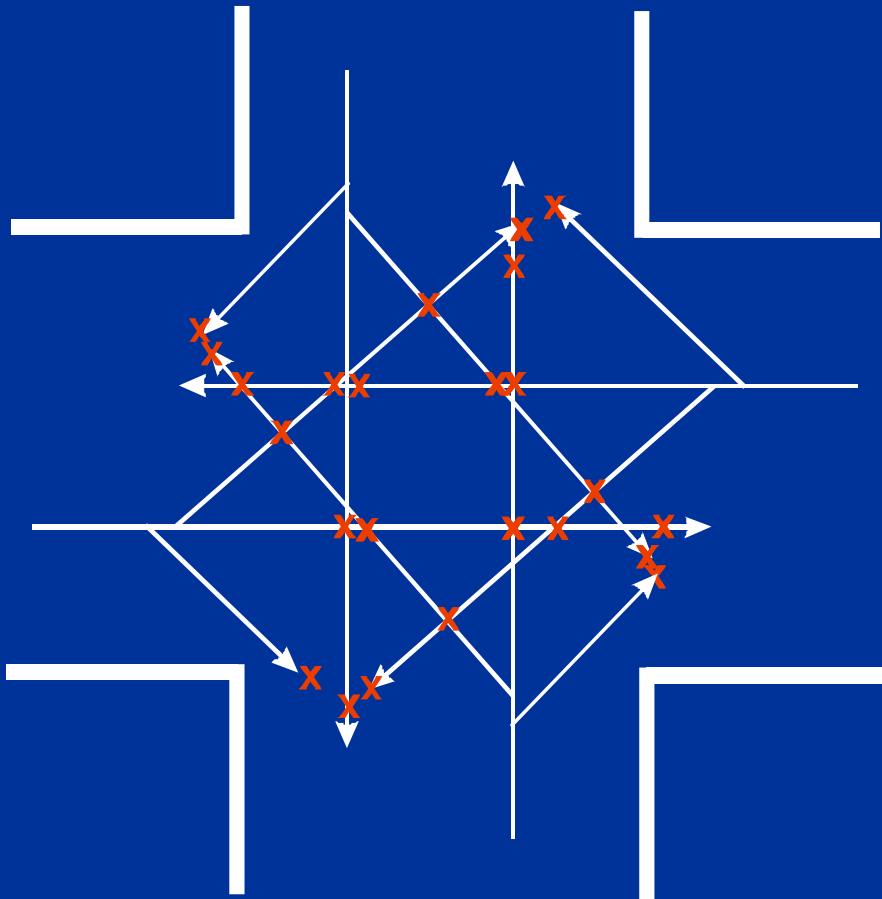
30,000 Ped injury



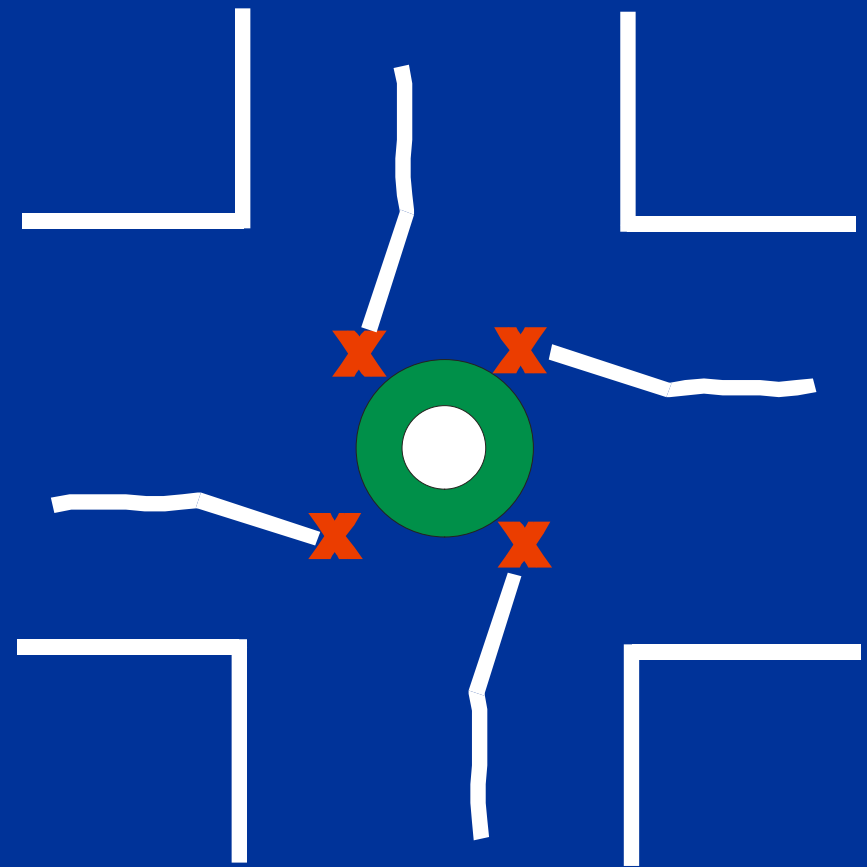
Angle Crashes Avoided

Reduced Conflict Points

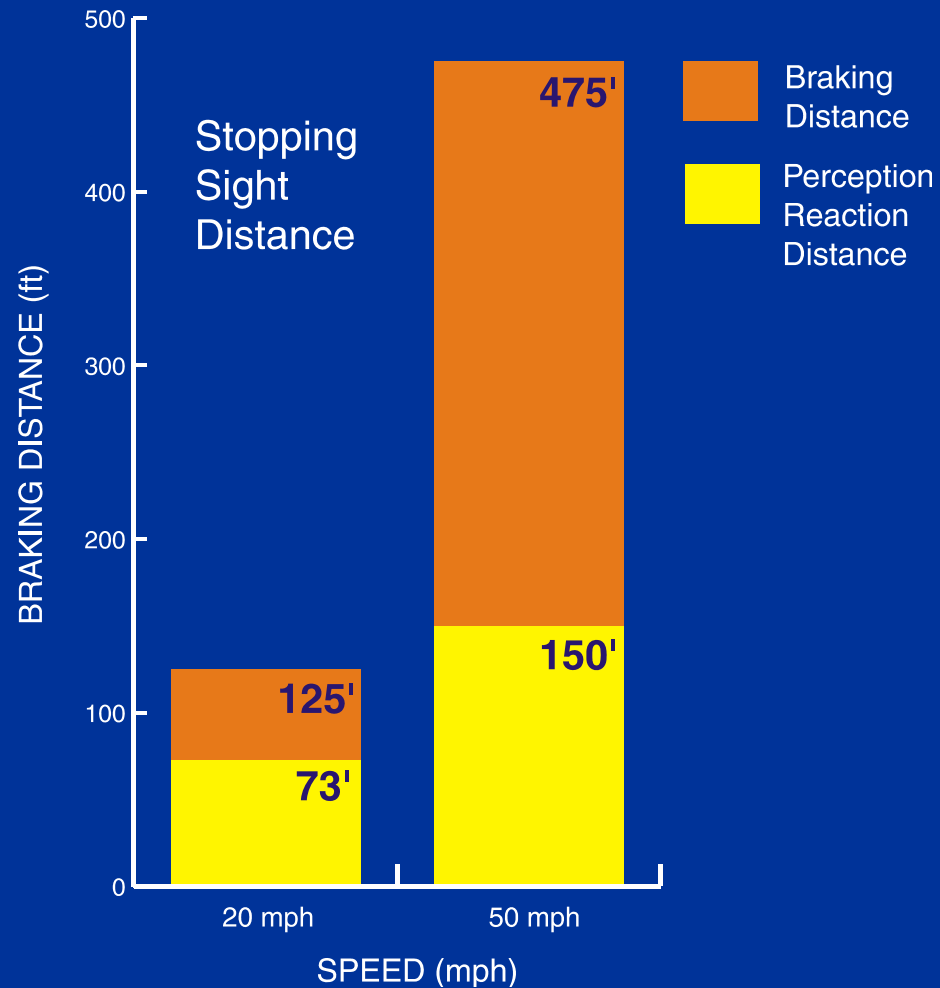
32 Conflict Points



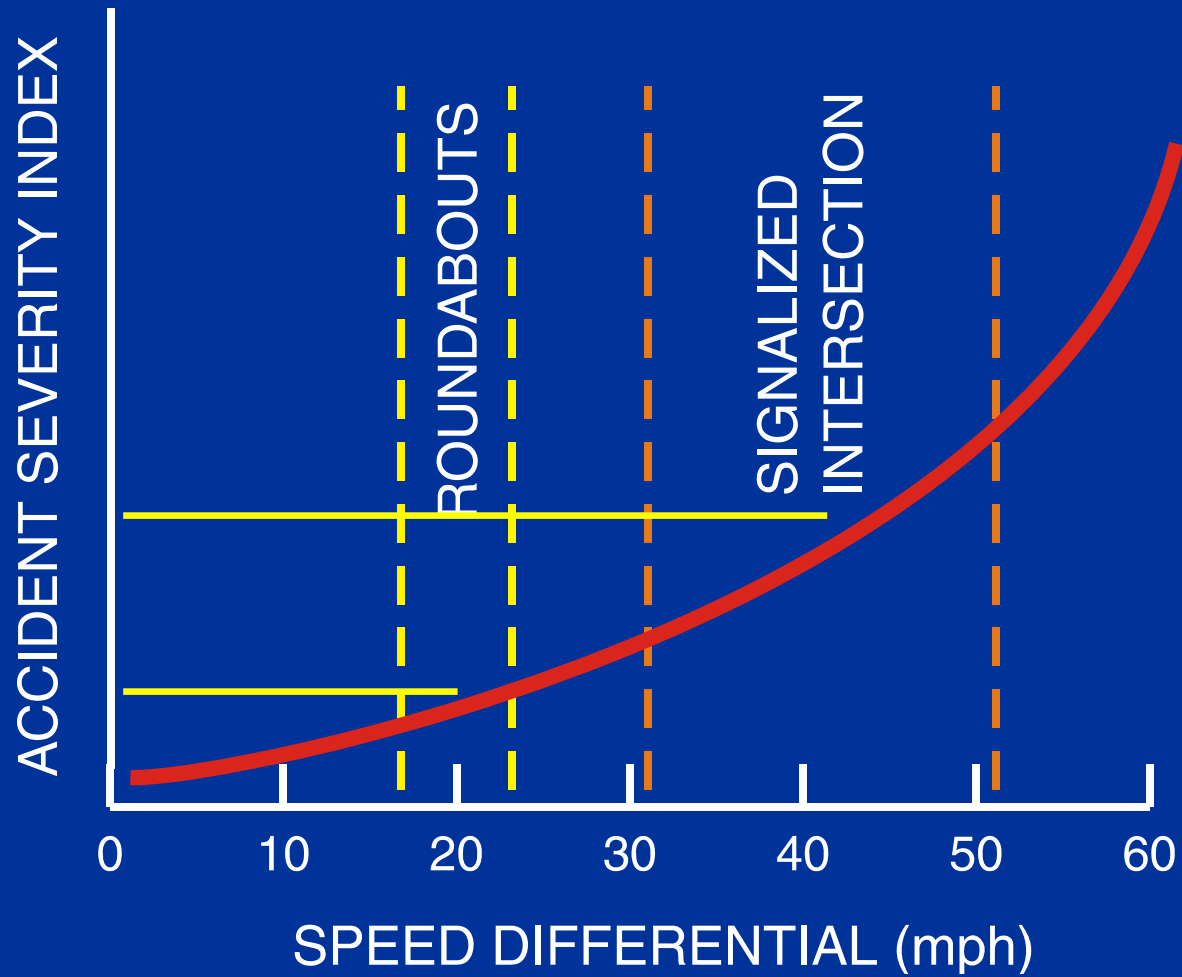
4 Conflict Points



Lower Speeds = Shorter Braking Distance

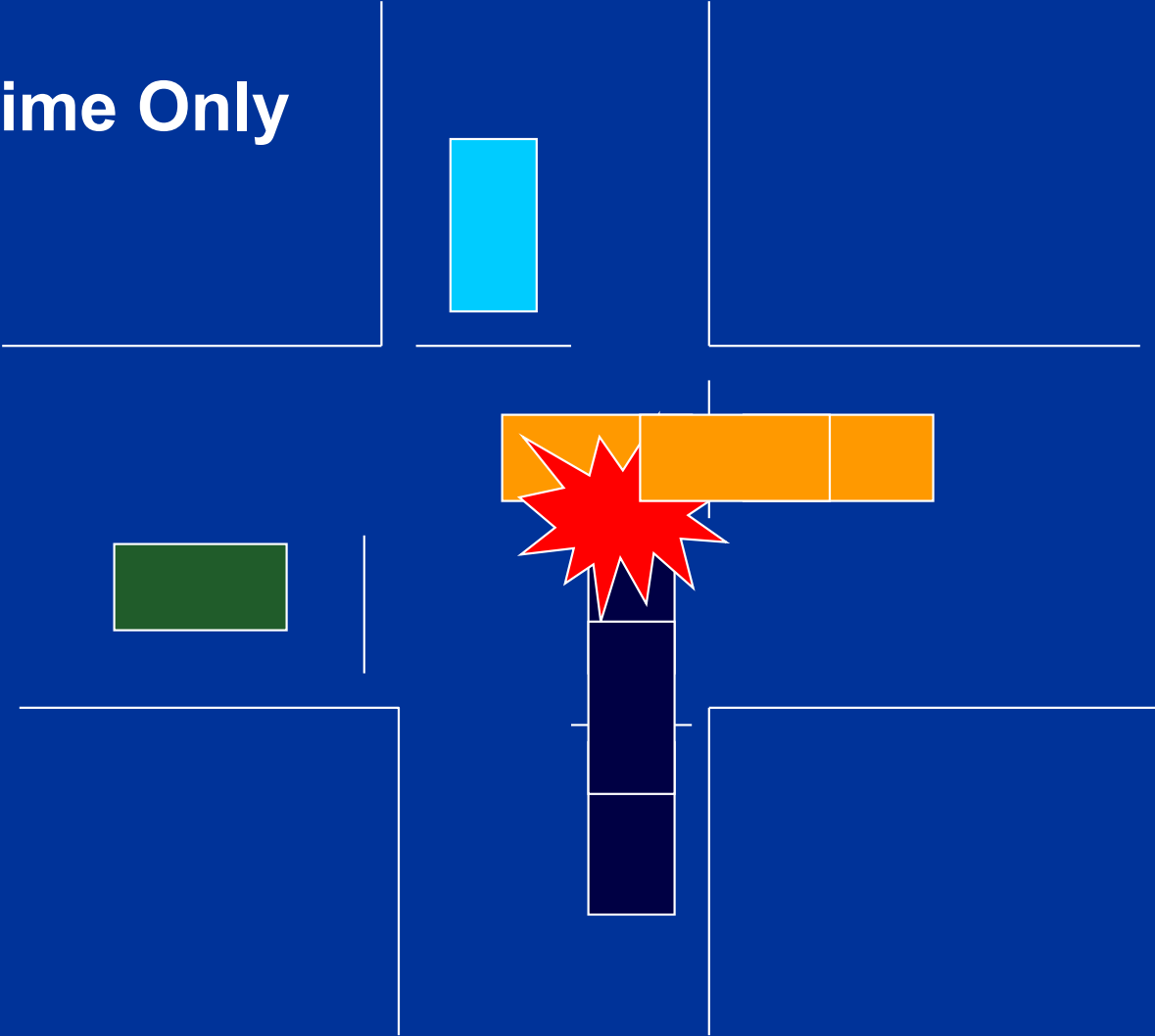


Accident Severity



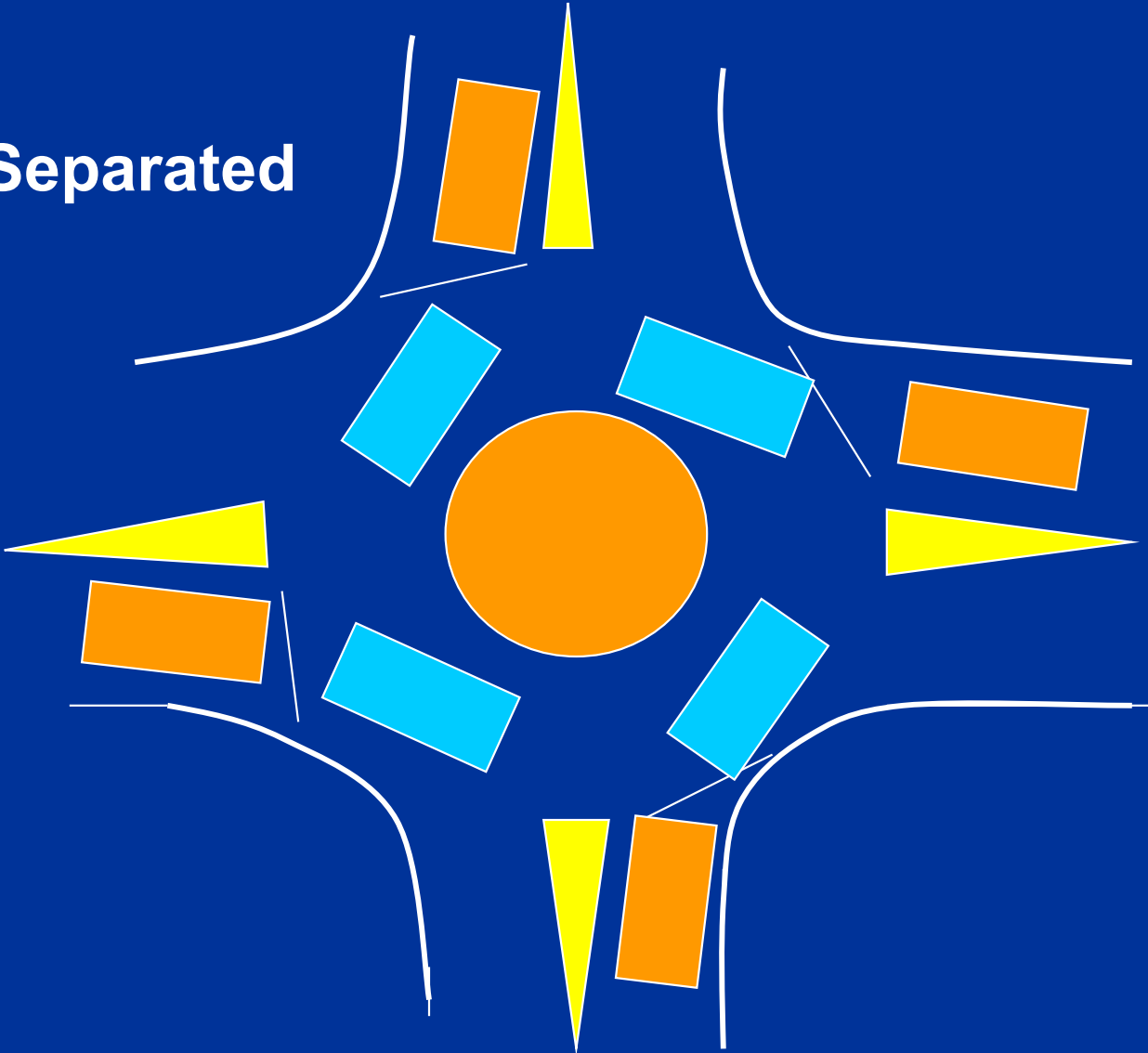
Implementing Roundabouts -Safety

Separated in Time Only



Implementing Roundabouts -Safety

Physically Separated





Pedestrians/Bike/ADA

Safety Design Principles for Slower Safer Roundabouts

Exhibit 4.5. Types of bicyclists.



Source: Kittelson & Associates, Inc., adapted from Dill and McNell (23).

Pedestrians

NCHRP
REPORT 674

NATIONAL
COOPERATIVE
HIGHWAY
RESEARCH
PROGRAM

**Crossing Solutions at Roundabouts
and Channelized Turn Lanes for
Pedestrians with Vision Disabilities**



TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES



*All Research Shows Exceptional Pedestrian Safety
Benefits can be Achieved with Roundabouts*

Pedestrian Safety:

- Speed Control Foundational**
- Design & Enhancements Promote:**
 - **Visual awareness**
 - **Way finding**
 - **Inviting environment**
 - **Safety and Comfort**



Pedestrians

- » Low speeds
- » Shorter crossing distances
- » Cross only one direction of travel at a time
- » Less Delay



Pedestrians

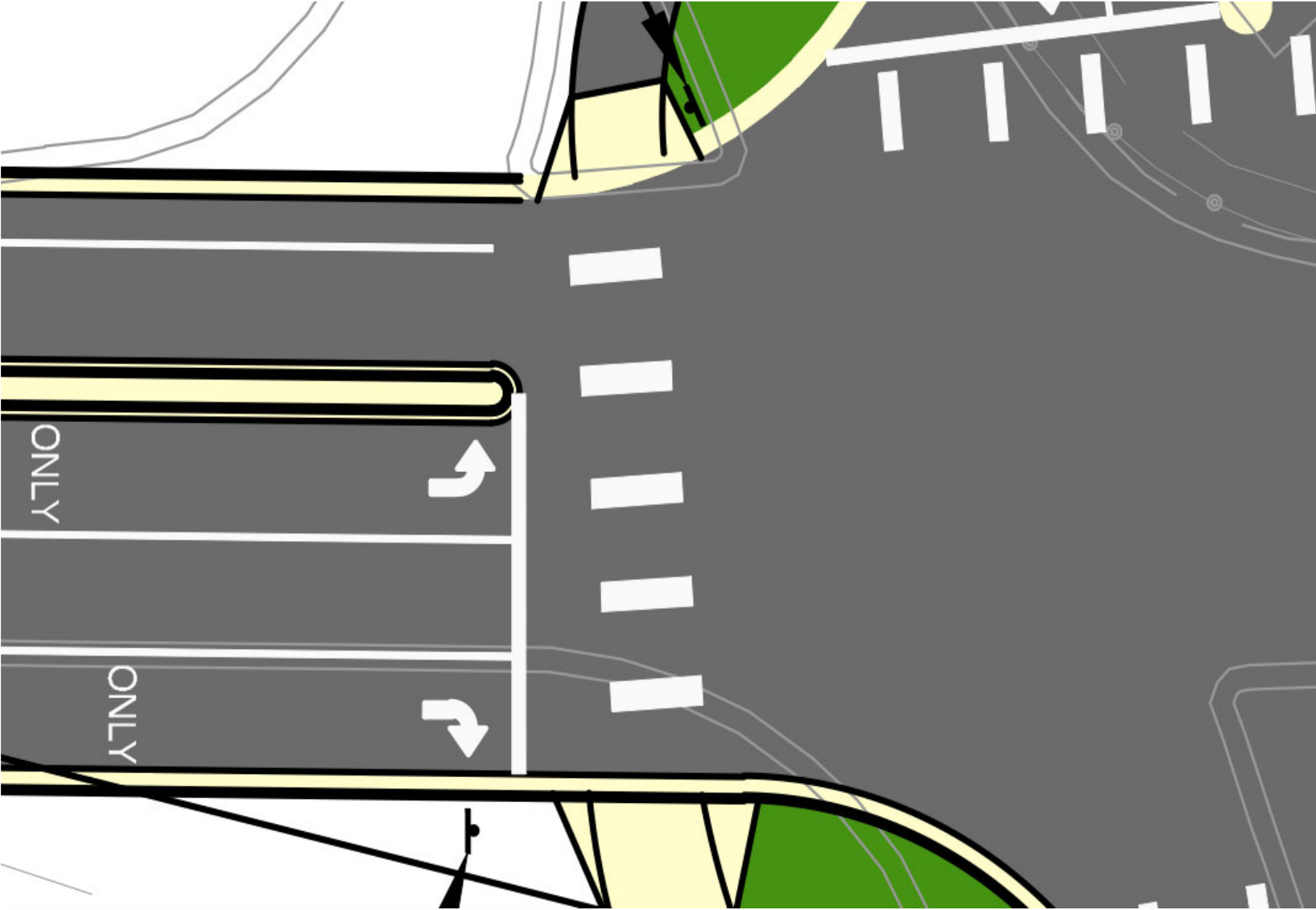
Signalized Alternative



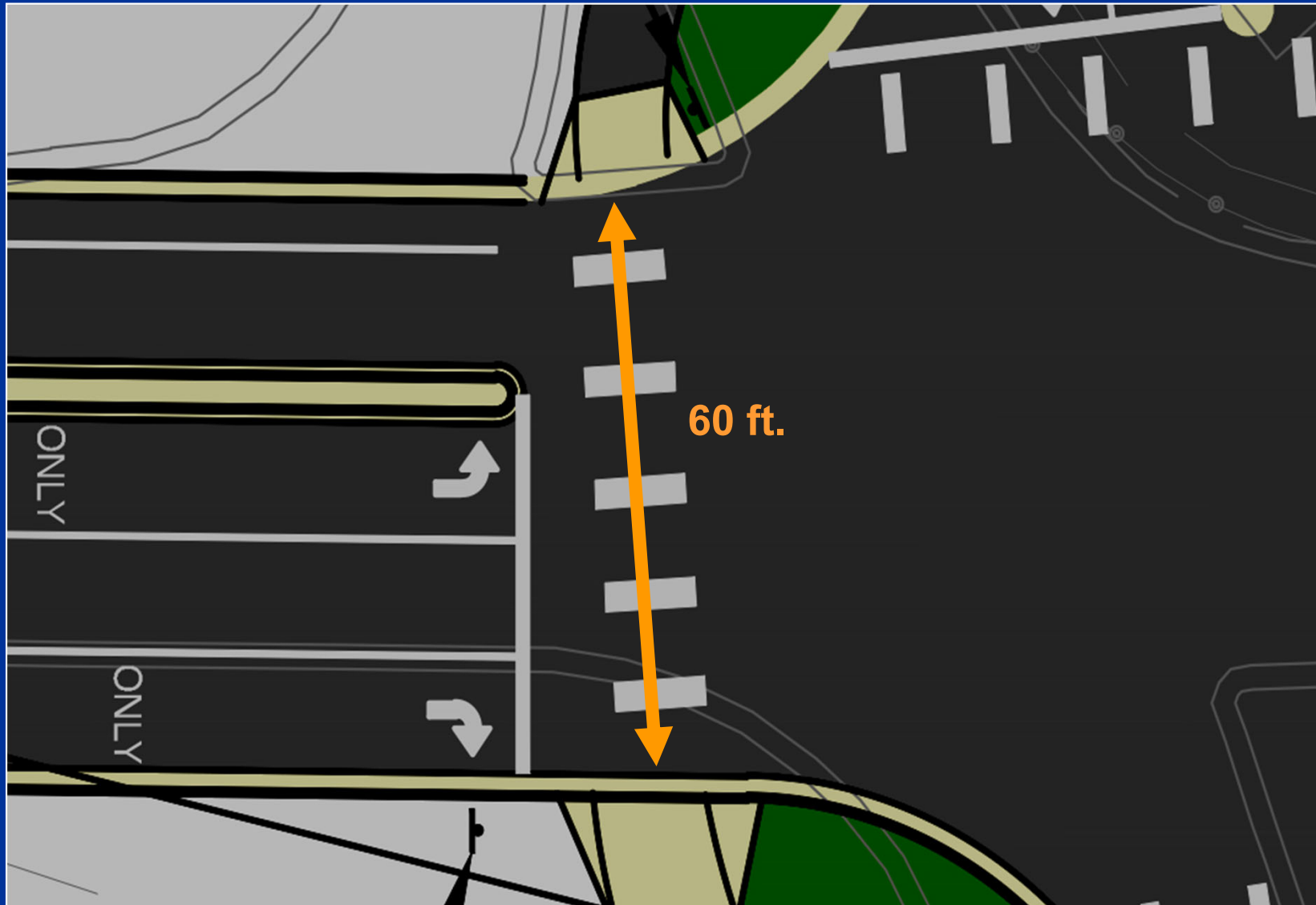
Roundabout Alt



Pedestrians/Bike/ADA

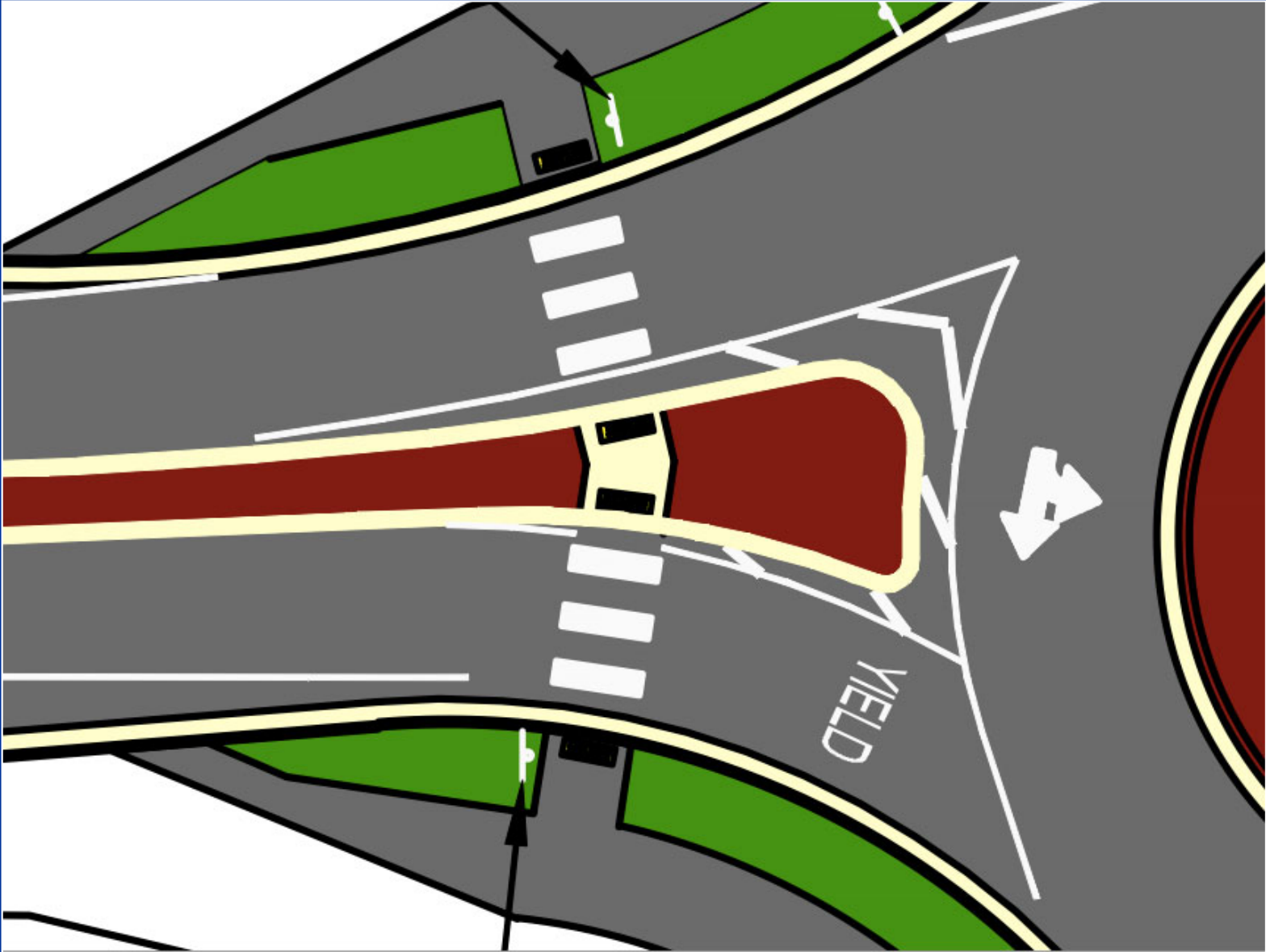


Pedestrians/Bike/ADA

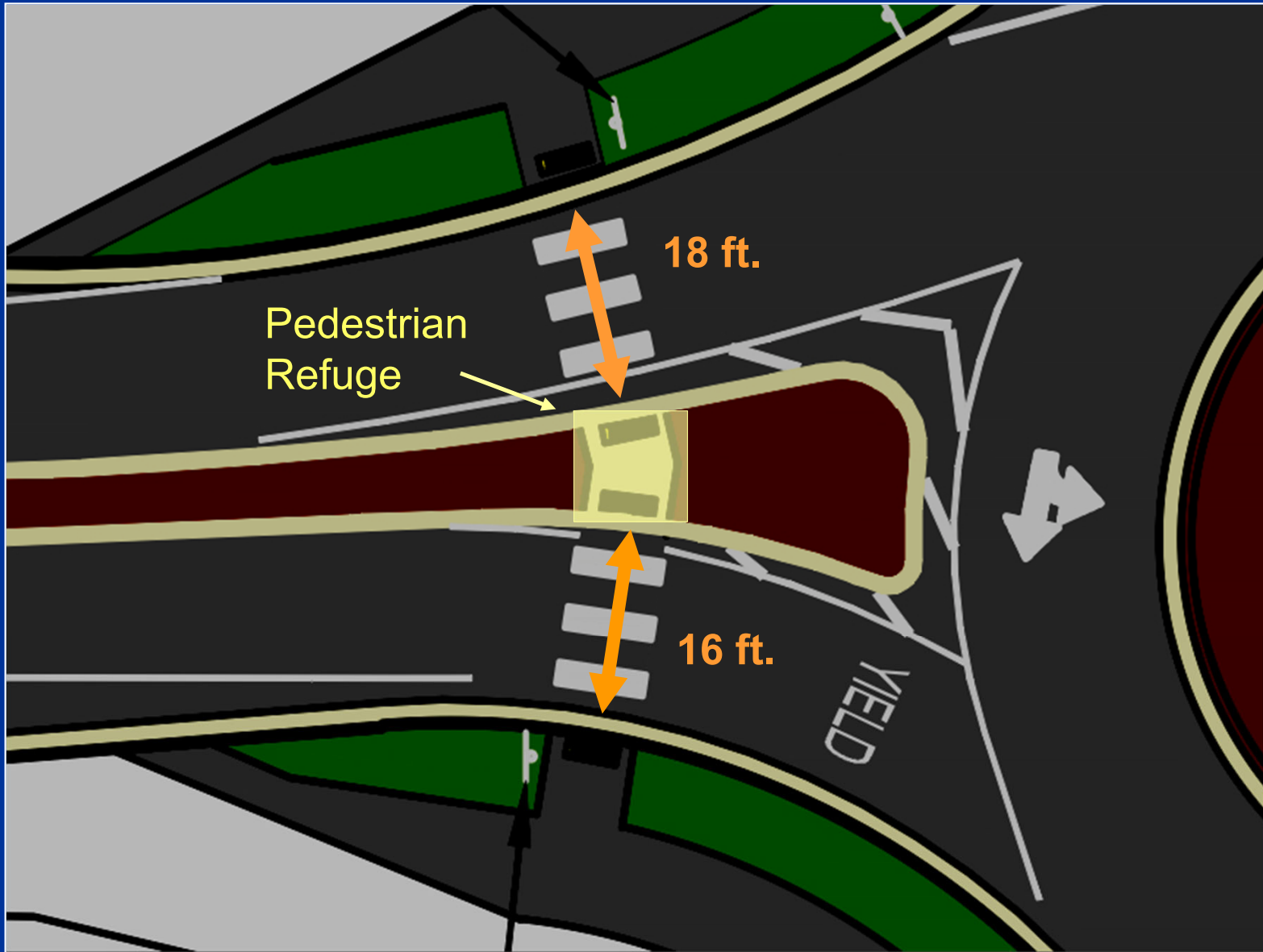


More Exposure

Pedestrians/Bike/ADA



Pedestrians/Bike/ADA



Less Exposure

Pedestrians

Roundabout (~3,800 vph)
Michigan State University, MI



Signal (4,200 vph)
Loveland CO



Pedestrians/Bike/ADA

**STH 119/ Main Street
Village of Waunakee, WI
160' ICD
Opened 2014**

Pedestrians



Pedestrians/Bike/ADA



Opened 2006

135' ICD



South Town Dr/Industrial Dr
City of Monona, WI

Pedestrians



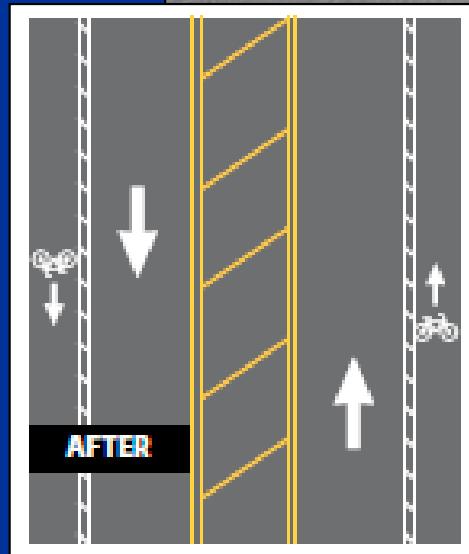
Rectangular Rapid Flashing Beacon (RRFB)

Pedestrians/Bike/ADA



Pedestrians/Bike/ADA

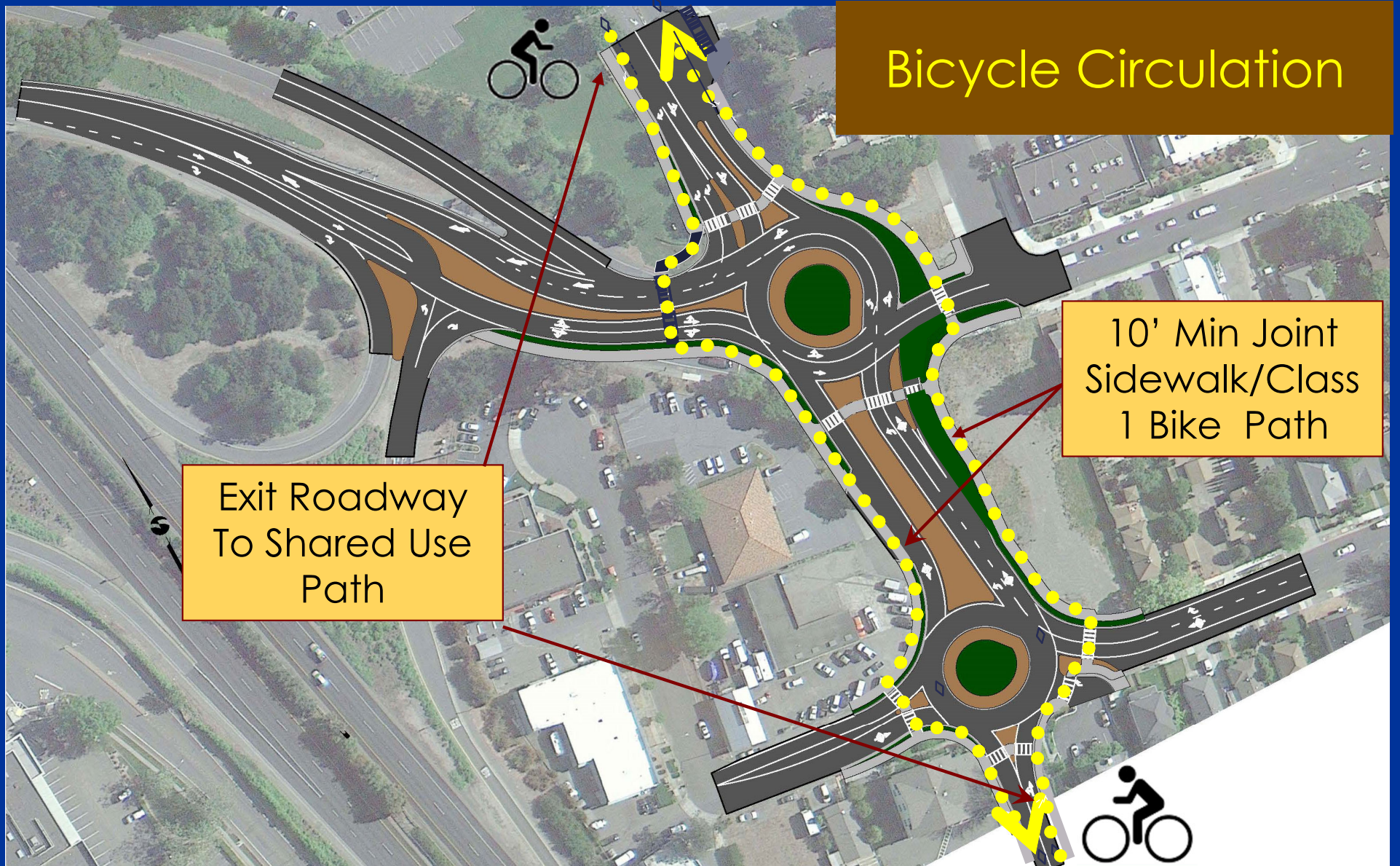
BIKES



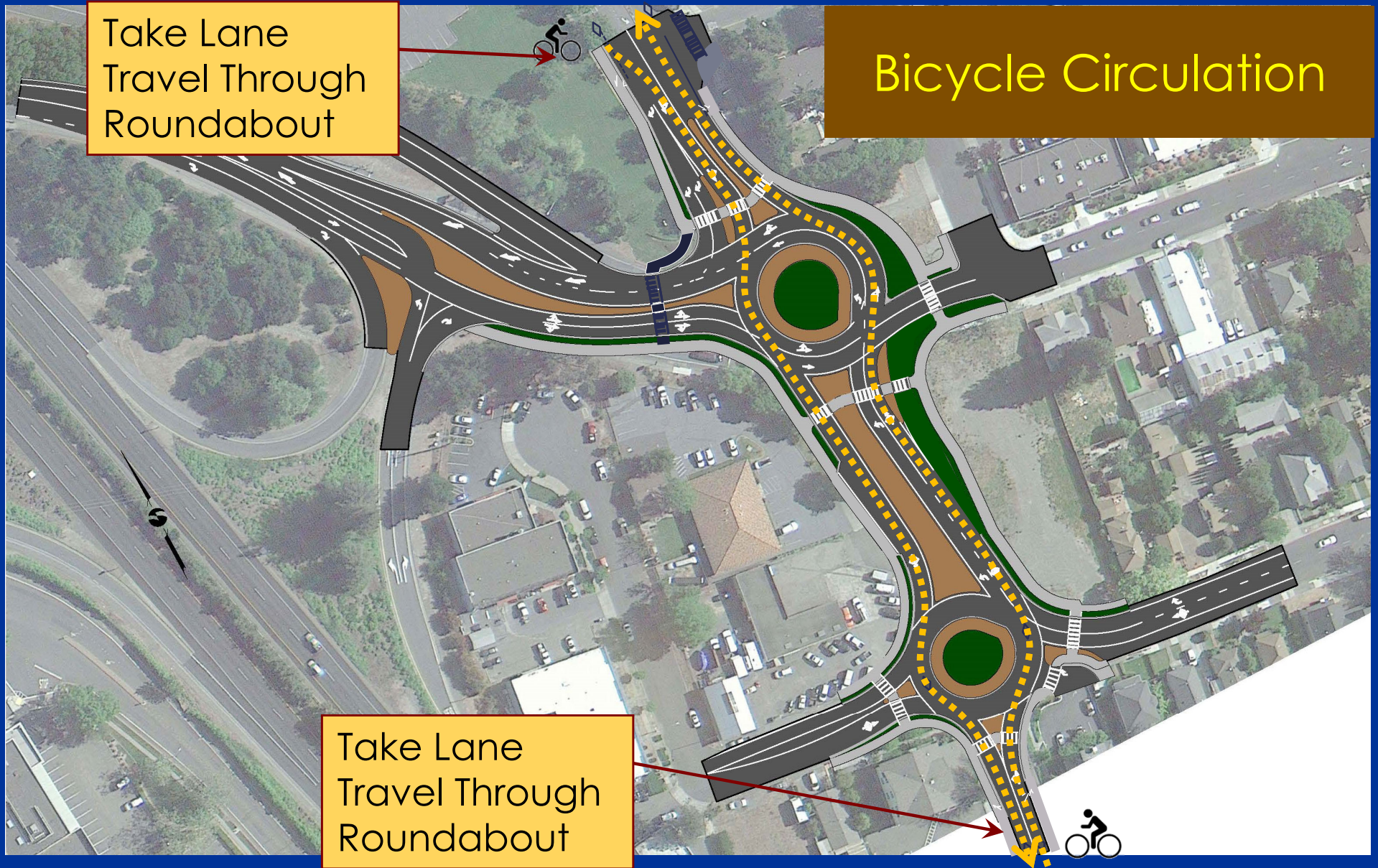
Bike Design Issues



Bike Design Issues



Bike Design Issues



Take Lane
Travel Through
Roundabout

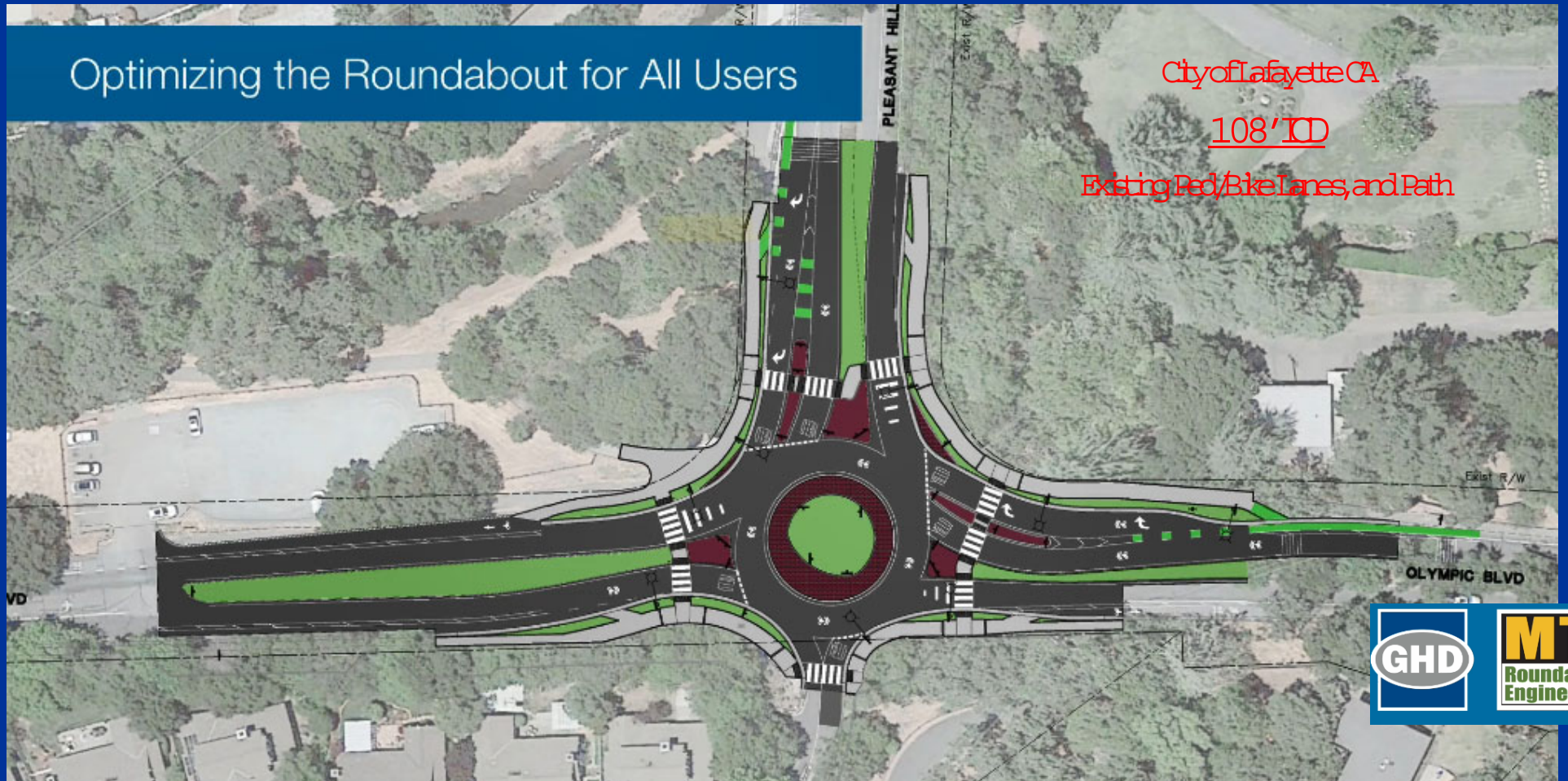
Bicycle Circulation

Take Lane
Travel Through
Roundabout



Lafayette, CA

Optimizing the Roundabout for All Users



BICYCLES - EASTBOUND ON OLYMPIC BOULEVARD
WITH PEDESTRIAN





Emergency Response, Freight, Trucks

Emergency Response



U.S. Department of Transportation
Federal Highway Administration

ROUNDABOUTS & First Responders Saving Lives Together



Designing for First Responders



Roundabouts are not designed to inhibit traffic. Rather, they are optimized for the safety and efficiency of all users. Roundabouts can be designed for large trucks, including a special purpose apparatus such as a ladder truck. This is accomplished by using features such as:

- Wider entry and exit lanes for efficient movement of traffic through the roundabout.
- Mountable aprons and curbs intended for use by vehicles with a wide and/or long wheelbase.
- Curvature and radii that allow for easy turning movements, including u-turns.



"Before the first roundabout was constructed in our city, our station arranged to visit one nearby so that we could experience it firsthand. That answered a lot of questions and helped build confidence in roundabouts."

- Brad Estochen
Minnesota DOT Safety Engineer &
Firefighter and EMT for the City of Woodbury

Emergency Response

- » Will our trucks get thru?
 - » Yes
- » What about response time?
 - » Improved
- » Driver reaction
 - » No different than other intersections,
 - » Drivers must clear
- » Safer for All

Frequently Asked Questions

When the first roundabout in a community is proposed, it is natural for first responders to have questions and concerns. Several of the most common questions are addressed below:

Q: Will all our vehicles be able to maneuver through a roundabout?

A: Roundabouts work for many types of large vehicles. Partnering with the road agency to conduct a "test drive" (laying out the roundabout in a large open area using cones and temporary devices) can help evaluate and influence the design.

Q: What about emergency response times?

A: At any intersection, traffic conditions vary throughout the day. Roundabouts can actually improve travel times by eliminating unnecessary stops and delays. Furthermore, the IAFF and other public health and safety organizations recognize that small differences in travel times rarely, if ever, impact incident or patient outcomes.³⁴

Q: How will drivers in our community know how to react to approaching emergency vehicles?

A: In this way, roundabouts are no different from other intersections – drivers must clear the intersection, pull off to the right, and let the emergency vehicle pass. To help educate drivers, there are many excellent resources available from states and cities where roundabouts are common. First responders can contribute to general roundabout education and outreach in a community by helping explain to the public how to react when an emergency vehicle approaches.

Q: Why consider roundabouts when we have traffic signal preemption in our city?

A: The use of preemption devices at signalized intersections remains a worthwhile option. However, in addition to being safer, roundabouts are viable in many places where traffic signals are not. Furthermore, even where signal preemption is used, first responders must obey state laws and department policies, and proceed cautiously – likely at speeds comparable to a roundabout.

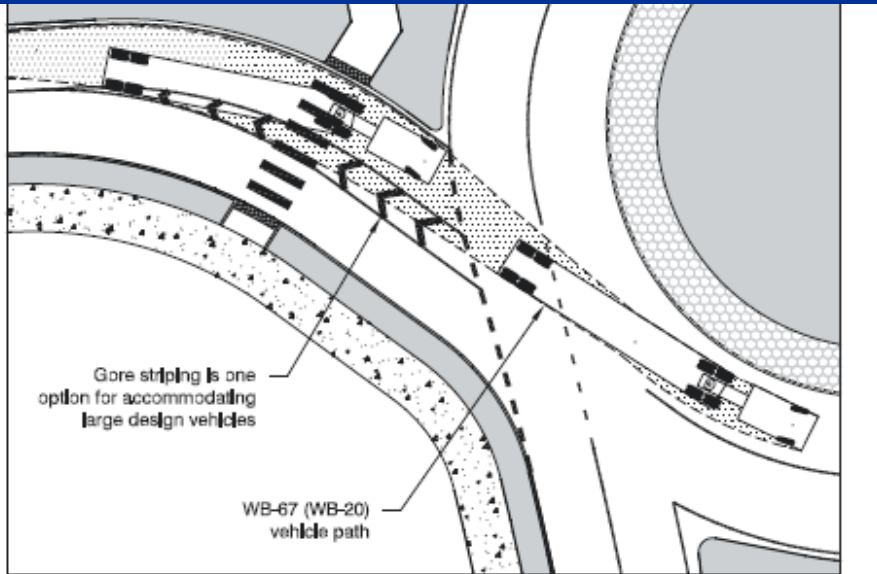
Freight, Trucks, Design Vehicles,

Design Vehicles

1 Ton Dually Crew Cab with Goose Neck Horse Trailer



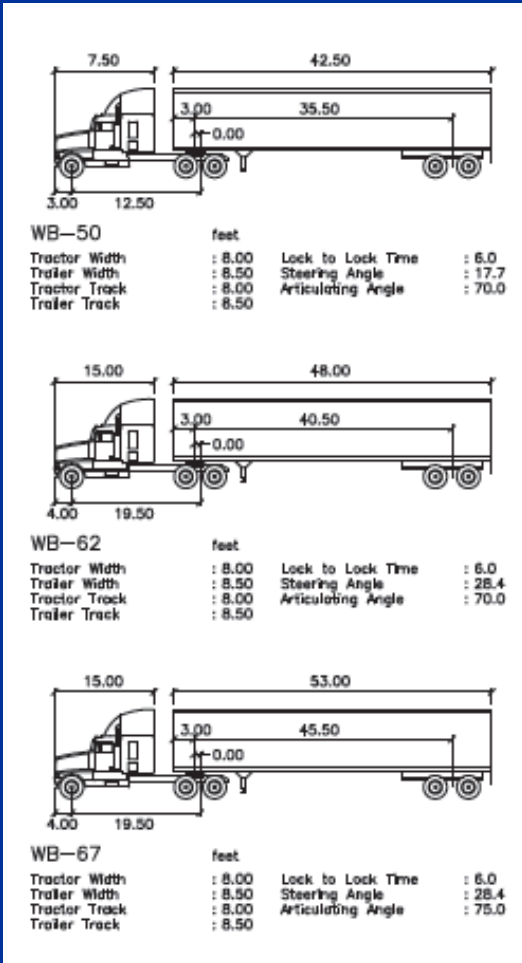
Freight / Trucks



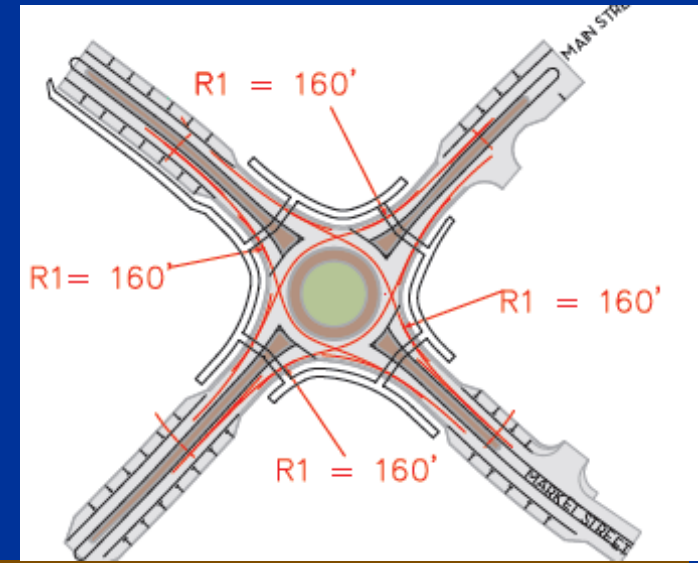
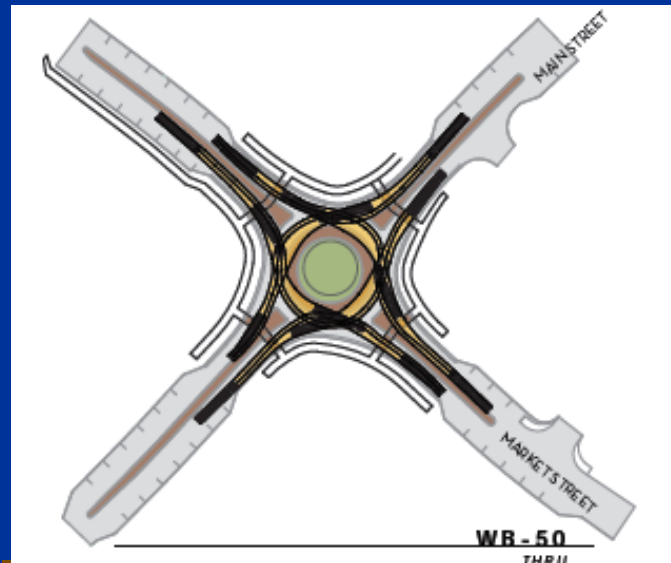
Source: New York State Department of Transportation (11)



Freight / Trucks



- Accommodate Design Vehicles
- Pedestrian Friendly



Roadway Planning Opportunities and Benefits



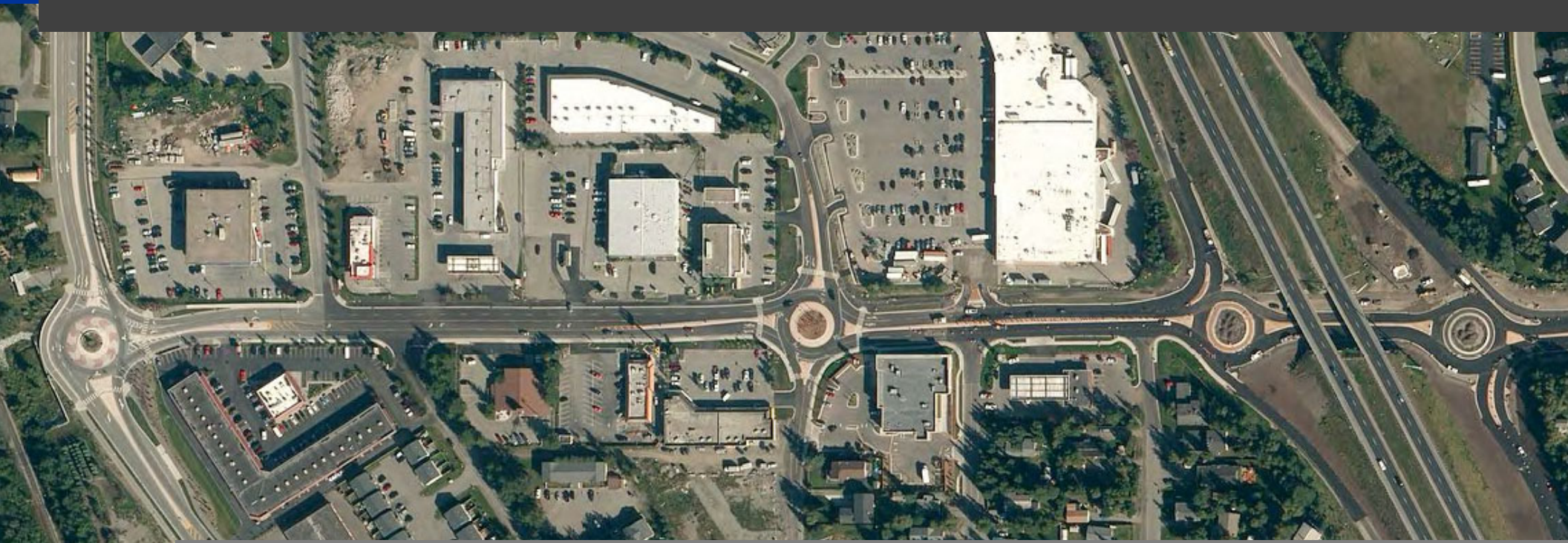
Congestion Occurs at Intersections



Signalized intersections dictate the layout and planning of our roadway network

Roundabout Operational Characteristics Allow for:

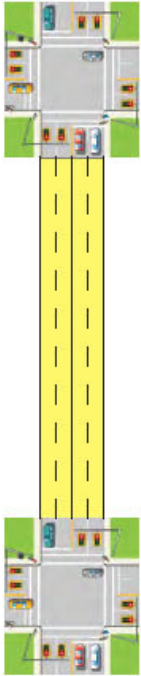
- Capacity at Intersection = Less Roadway Widths
- Roadway Geometric Flexibility
- Intersection Spacing Versatility
- Different Access Control Opportunities (speeds, decisions, u-turns)



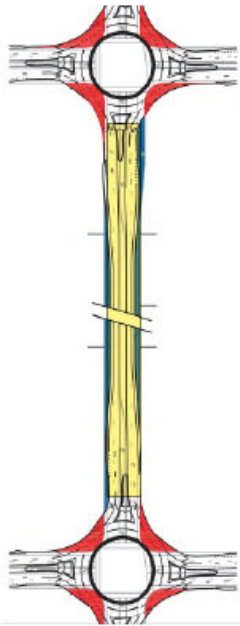
Huffman Road Corridor, Anchorage, AK - No Roadway Widening (3 Lanes)

Traffic Planning & Economic Development

Cross Section with Signals



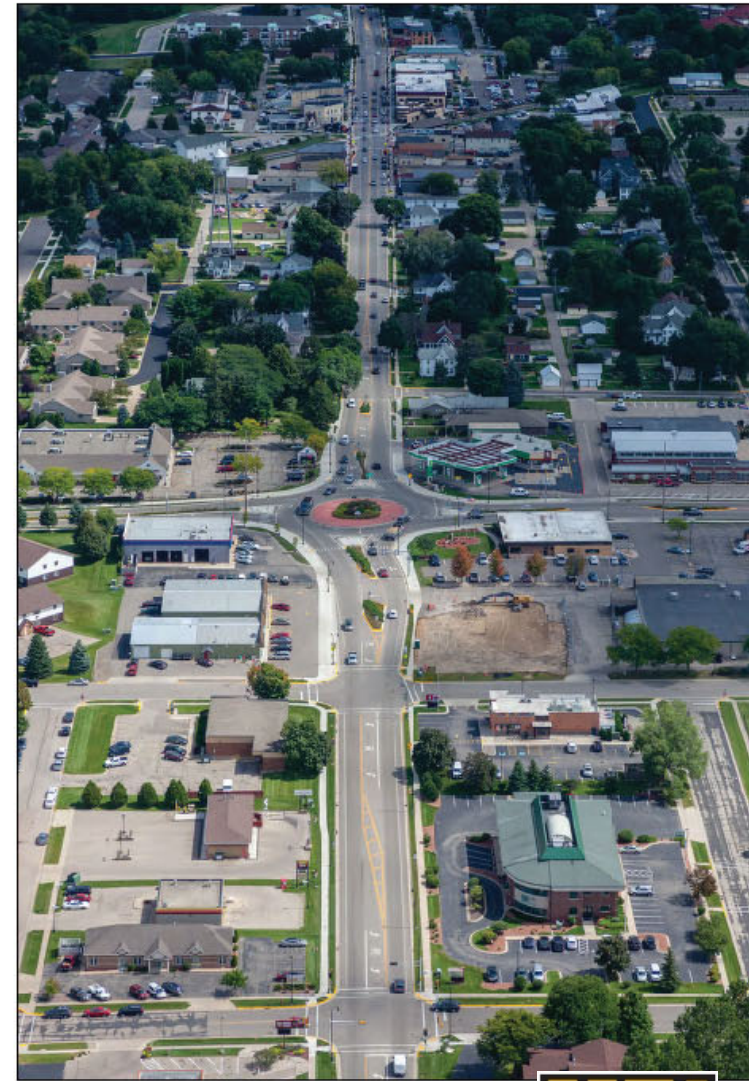
Cross Section with Roundabouts



Traditional 4-lane widening with signals



2-lane cross section with flared entry roundabout



Flared Entries
Provide Capacity
at Intersection

Roadway widening cross section is dictated by signals

Traffic Planning with Roundabouts

- Benefits – Business vitality maintain on-street parking, reduced impacts

**Show
Video**

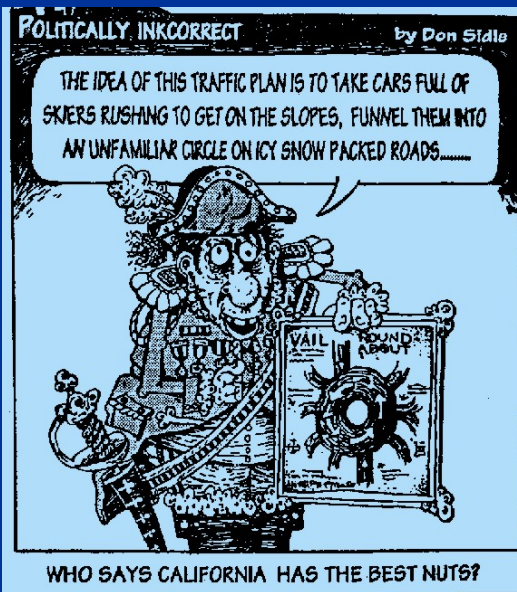


Public Involvement



Public Involvement

Community Acceptance



The Vail Trail - January 5, 1996

Editorial

Shocker: Maybe the roundabout isn't so bad after all

We at the Trail have had a lot of fun the past year taking stabs at Vail's roundabout, projecting all manner of doomsday scenarios for the project.

...Our primary concern was the combination of slick roads, rental cars, and an unfamiliar driving concept. However, people seem to have figured out the contraption. What's more, gridlock appears to be gone.

Voted Best Public Works Project 5 Years Straight



Video Courtesy of: Peter Doctor

Public Involvement Case Study #1

Testimonial

As a resident of the neighborhood for 55 years, Earl Keding, 82, figures the roundabout will control traffic flow.

"They've got it marked well and it'll help, because people will have to slow down some," said Keding, who took his turn around the intersection Tuesday.

"I went around it. It's not any worse than any other street."



Public Involvement Case Study #2



First on State Highway

GUEST COLUMN

Beware the scourge of traffic circles

By Robert A. Hall

The Wisconsin State Journal tried to disguise the bad news by using a British word to make it sound quaint. But the headline Saturday — “Mount Horeb to get first roundabout in the county” struck ice in our hearts.

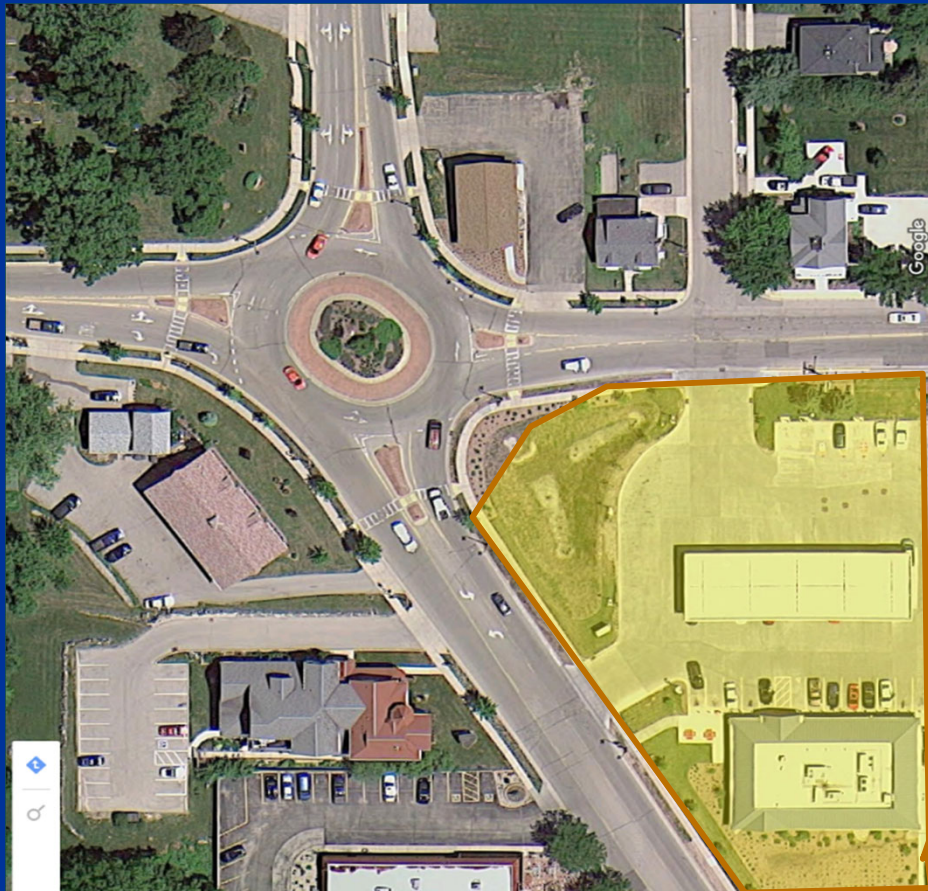
We are refugees from that quintessential East Coast state, New Jersey. And trust me, it’s not the Sopranos that make the Garden State frightening — it’s the traffic circles.

Public Involvement Case Study #2



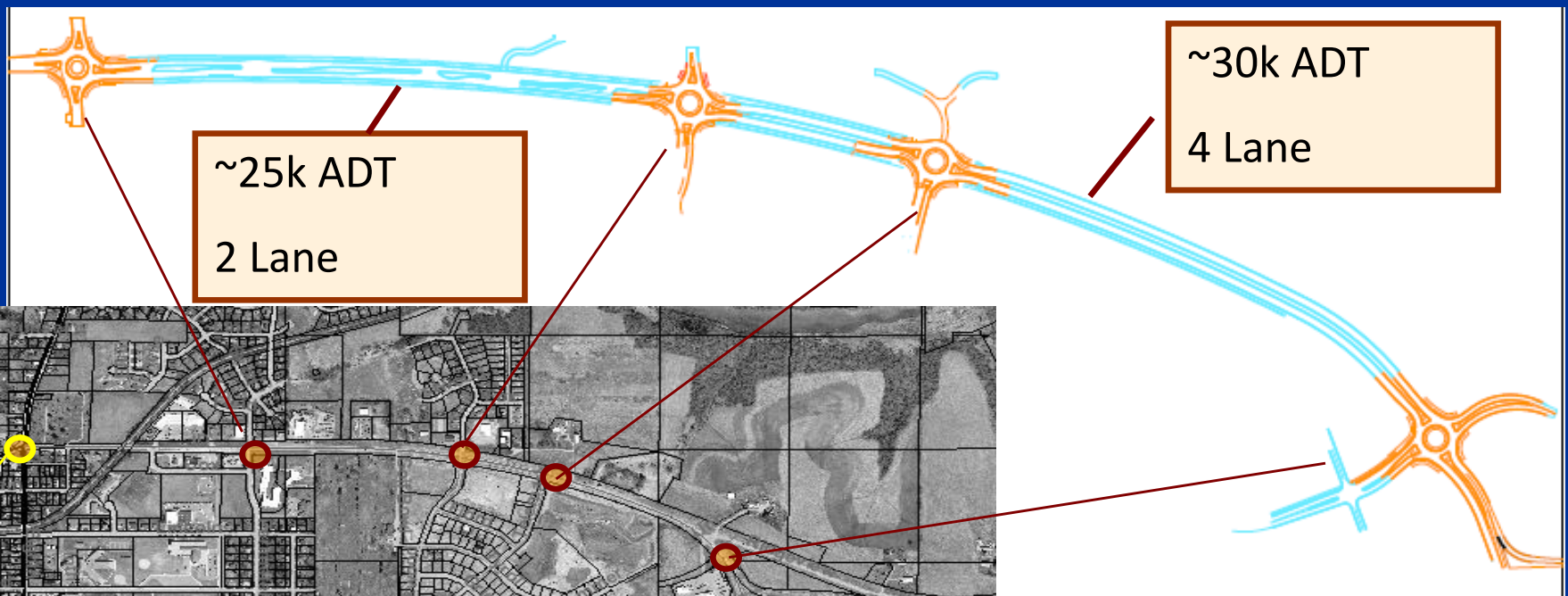
* Business Access

Public Involvement Case Study #2



**OPERATIONAL CHARACTERISTICS
PROMOTE
SAFE & EFFICIENT ACCESS.**

Public Involvement Case Study #2



~25k ADT
2 Lane

~30k ADT
4 Lane

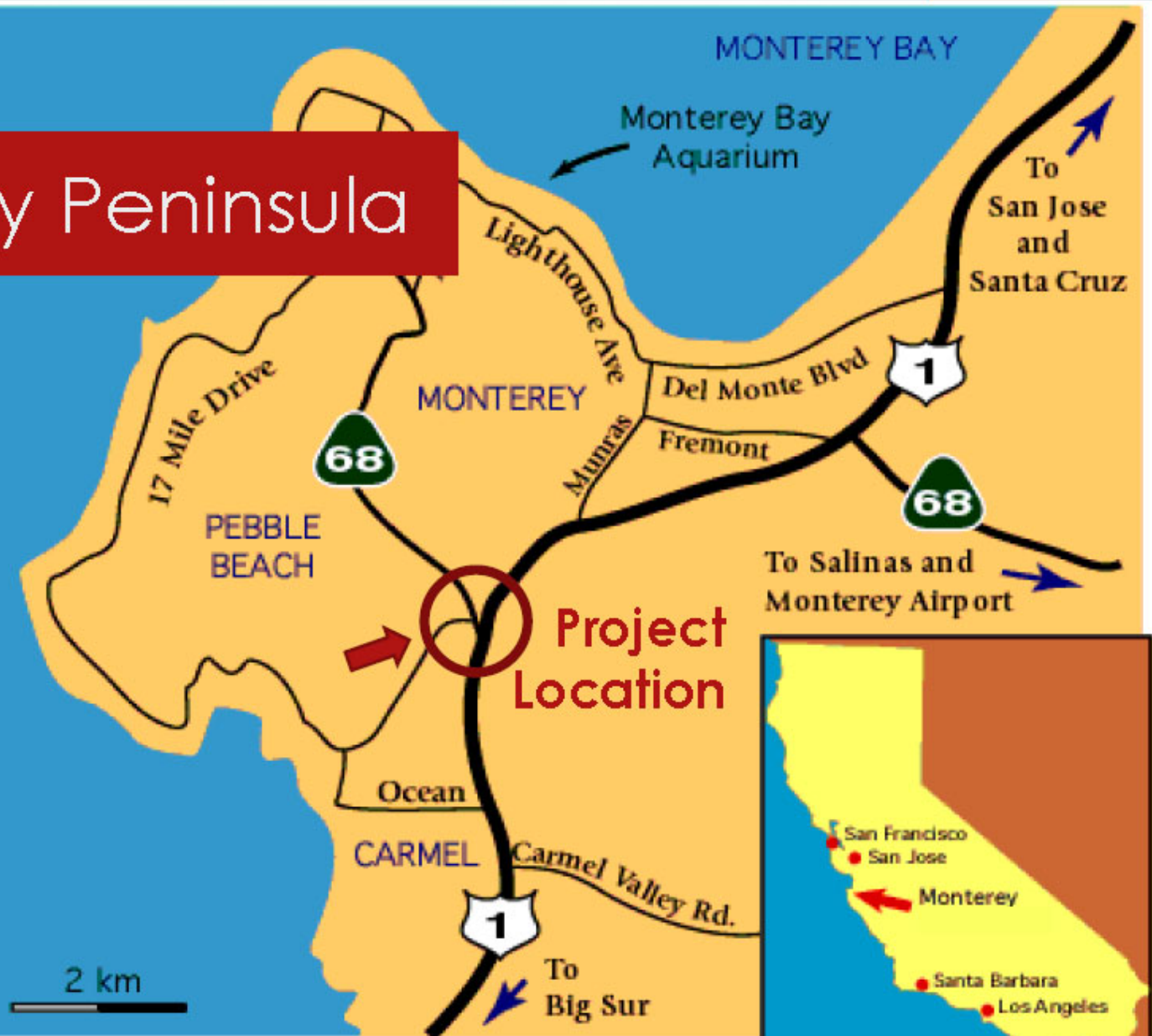


Public Involvement Case Study #3

Monterey Peninsula



HOLMAN HIGHWAY
ROUNDBABOUT



Public Involvement Case Study #3



Holman Hwy

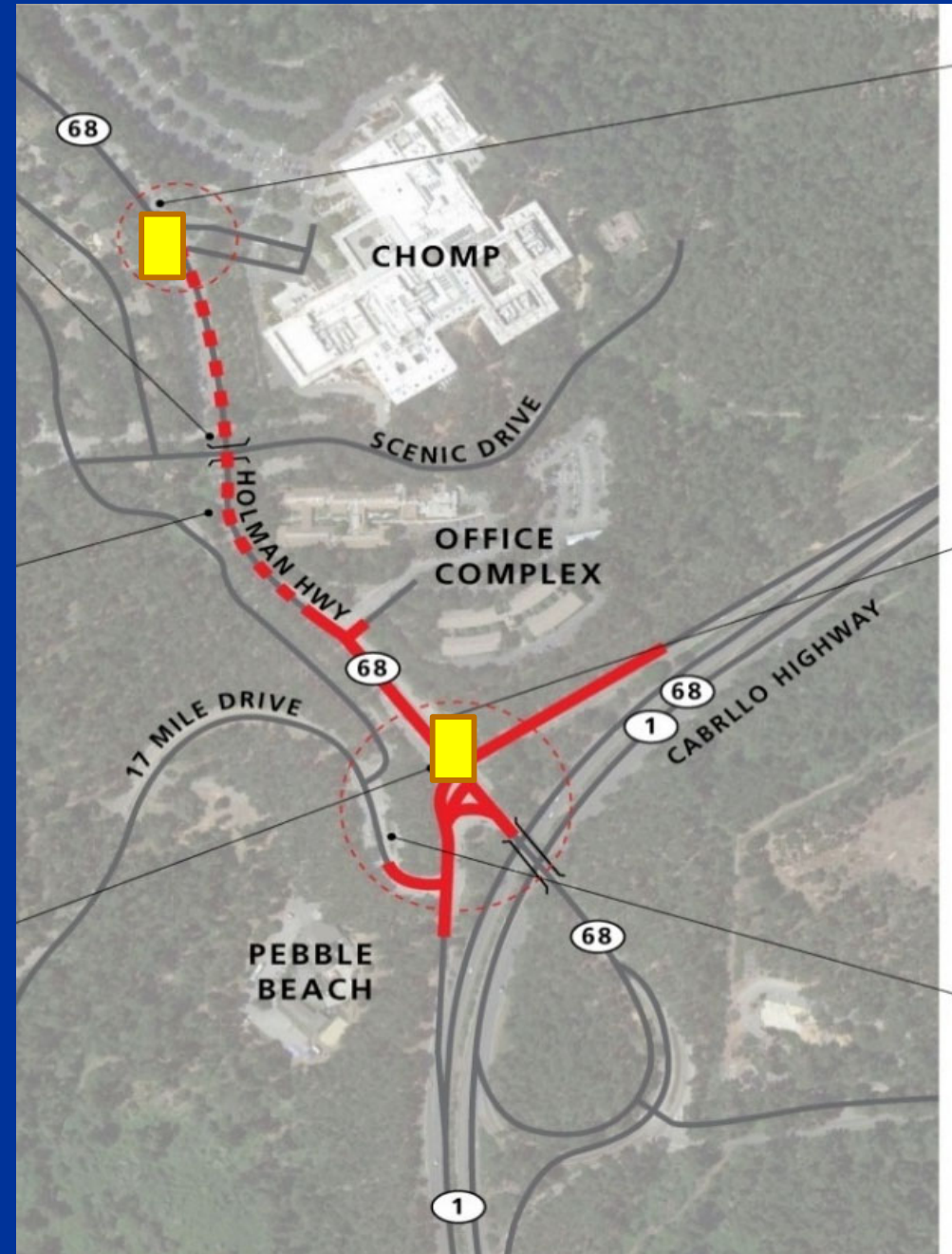
- Highly Constrained
- Congestion
- Emergency Response Issues
- Primary Access to the Monterey Peninsula



Public Involvement Case Study #3

Traffic Signals & 4 Lanes

TOTAL ESTIMATED COST EST.
= \$27M



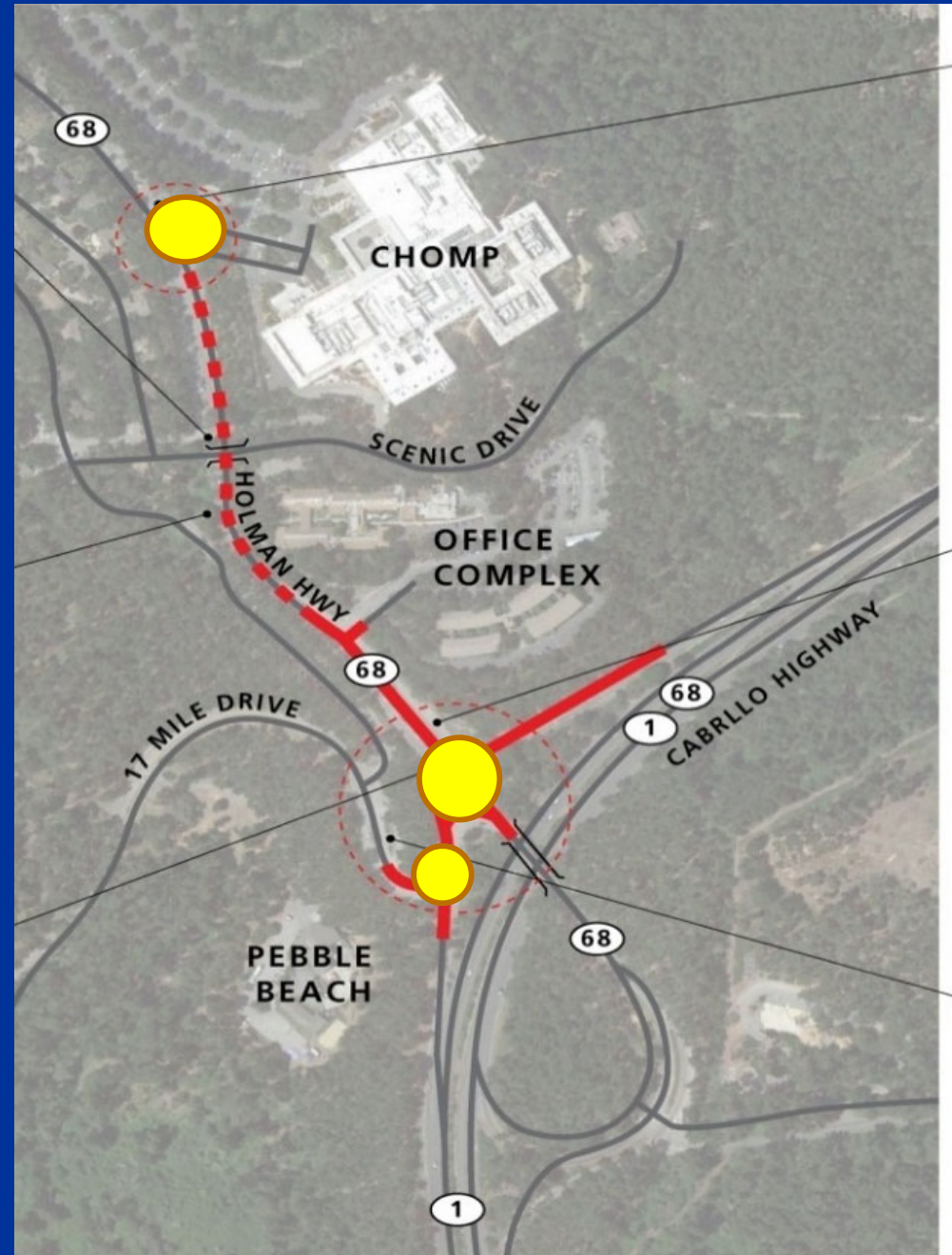
Public Involvement Case Study #3

Roundabout Design

TOTAL ESTIMATED COST EST.
= \$12M

ROUNDAOBOUTS –
NOW IDENTIFYING NECESSARY

Savings of \$15M



Public Involvement Case Study #3



Photo Courtesy of Rich Deal, City of Monterey Traffic Engineer

Public Involvement Case Study



EDITORS AT THE MONTREY COUNTY
WEEKLY
NAMED HOLMAN HIGHWAY
ROUNDAABOUT AS THEIR COUNTY'S
"BEST USE OF GOVERNMENT FUNDS" IN
2017



Successful Car Week Loading

Public Involvement Case Study

**Show 4.5 min Video
from MTJ Website**

**Holman Highway 68/Highway 1
Roundabout**
Monterey Peninsula, CA



<https://youtu.be/50sFiqRrQqc>

END Questions?



Mark T. Johnson, P.E.
MTJ Roundabout Engineering