



# ***Roundabouts: A Safer Choice***

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(Retired)



FHWA Video:  
Modern Roundabouts:  
A Safer Choice



# What is not a modern roundabout?

Rotary



Photo: City of Fort Worth, TX

Traffic Circle



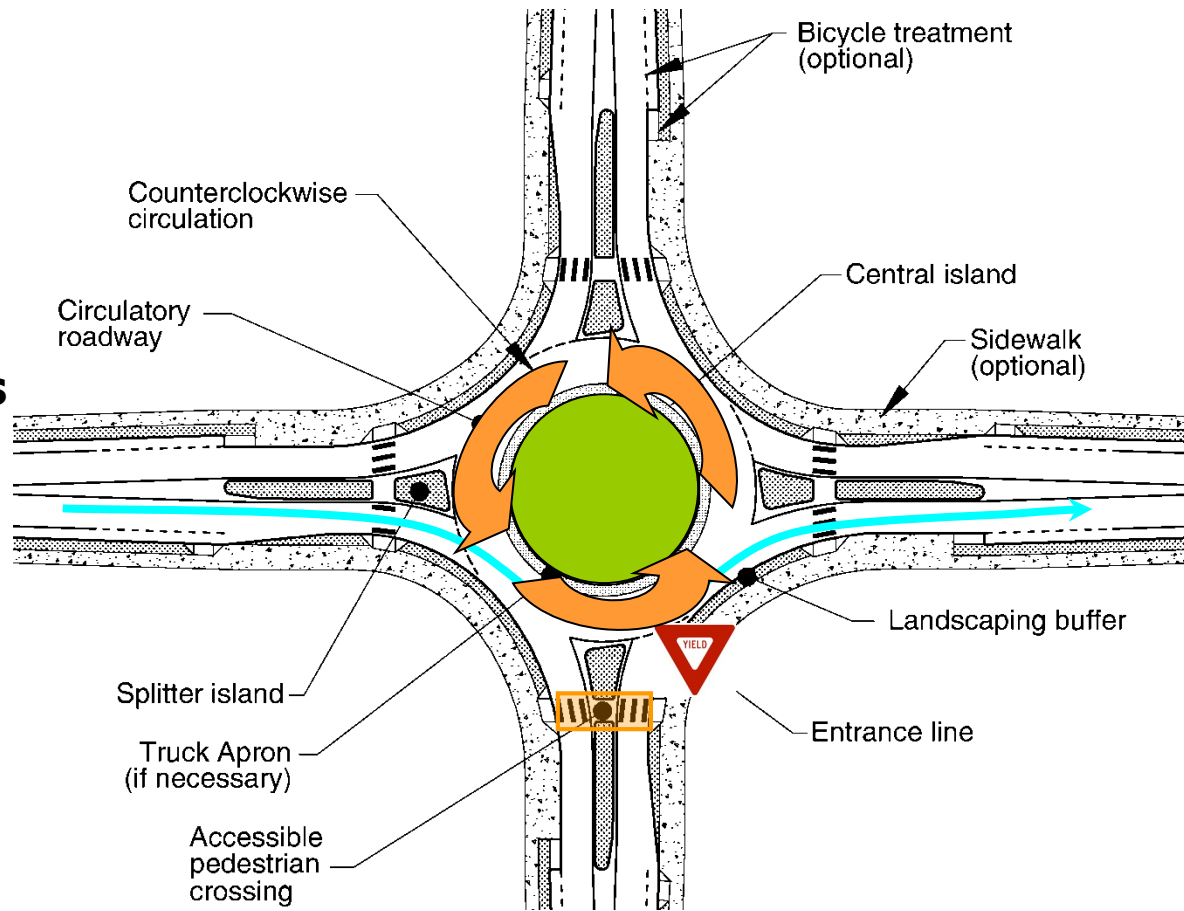
Neighborhood Traffic Circle



Photo: Lee Rodegerdts

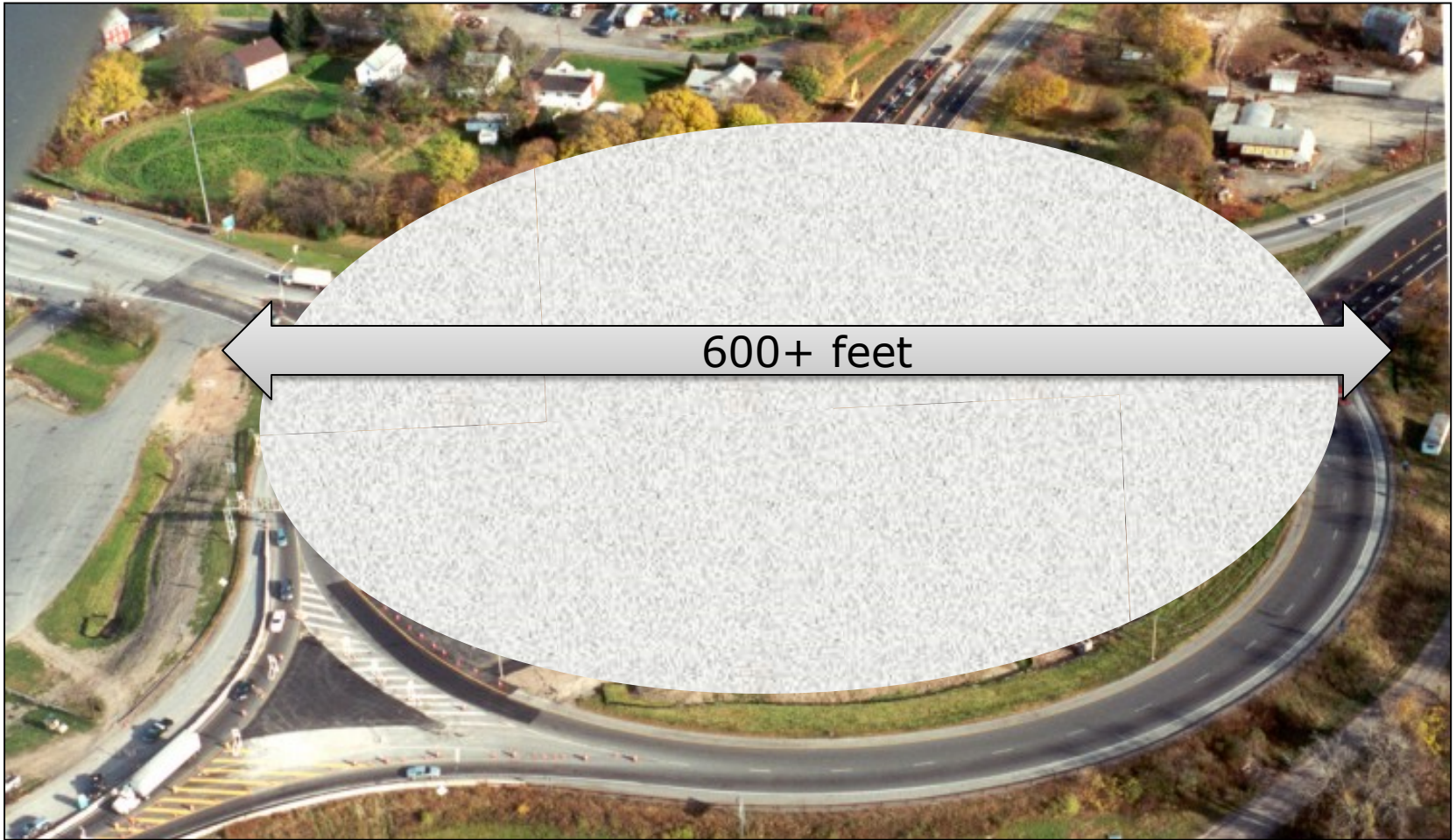
# What is a modern roundabout?

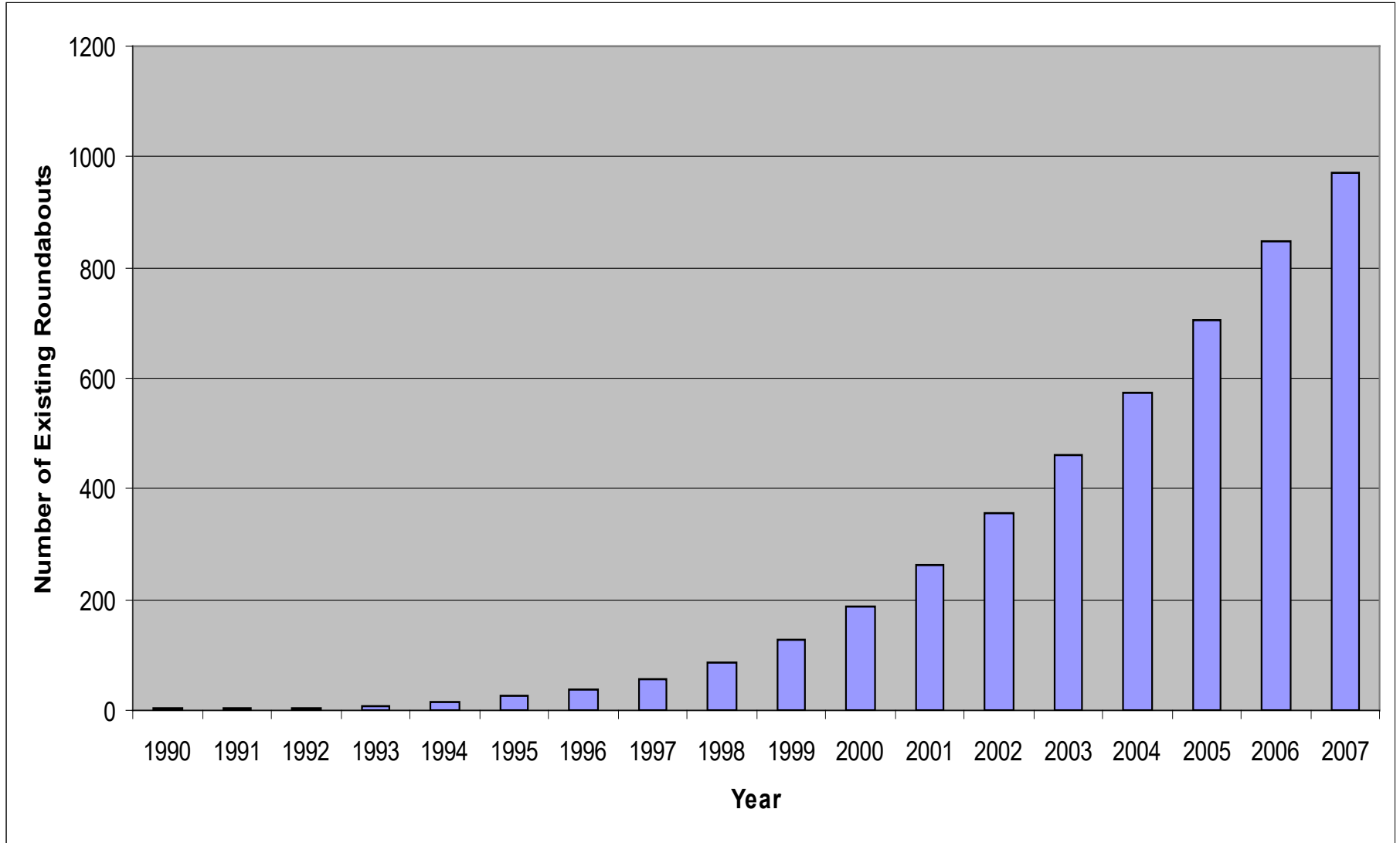
- **YIELD control on entry**
  - Priority to circulating vehicles
- **Slow, consistent speeds**
- **Landscaping**
- **Pedestrian access & crossing**
- **No Parking**
- **Direction of circulation**
  - Channelization



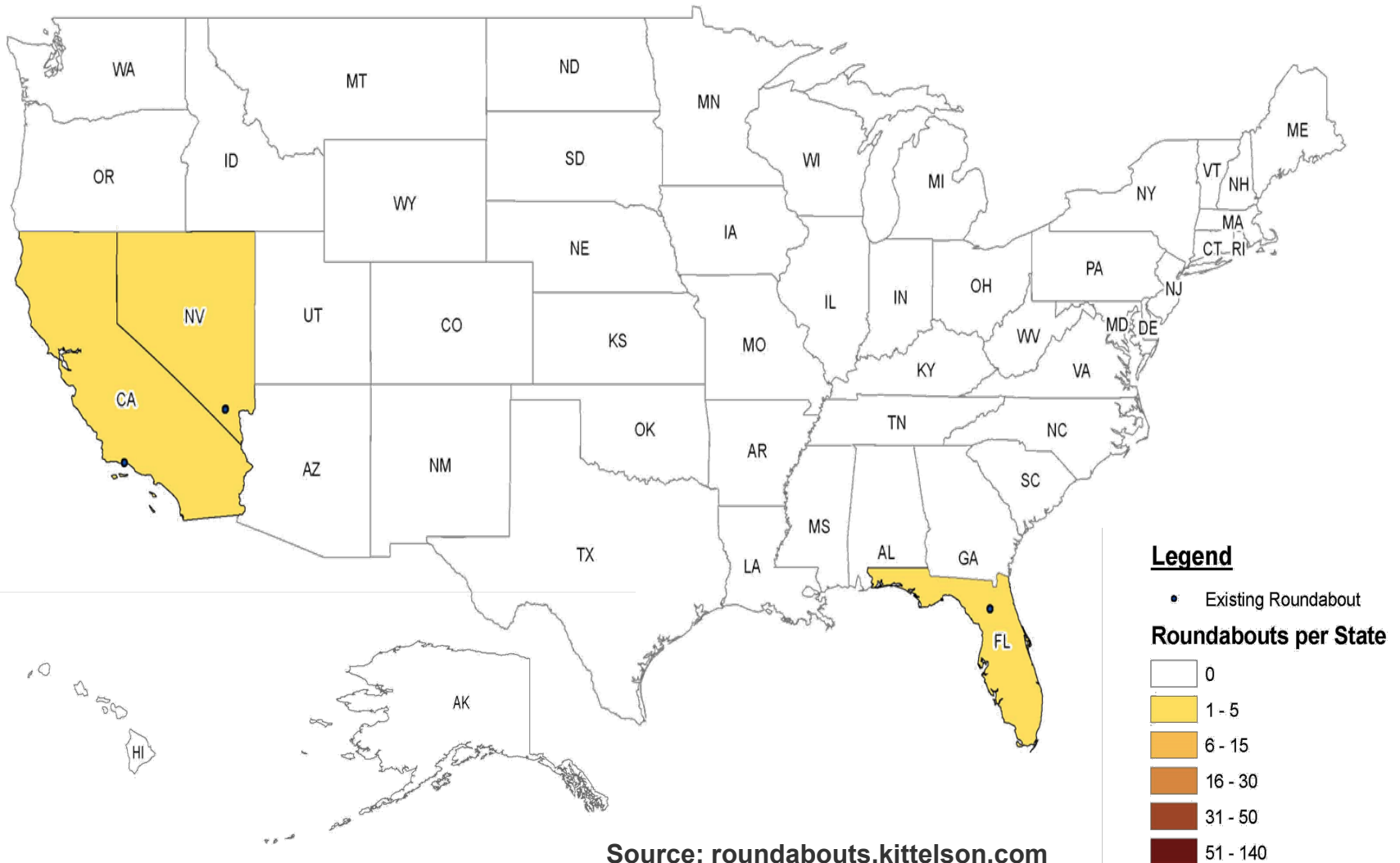


# *Conversion of Rotary to Roundabout: Kingston, NY*



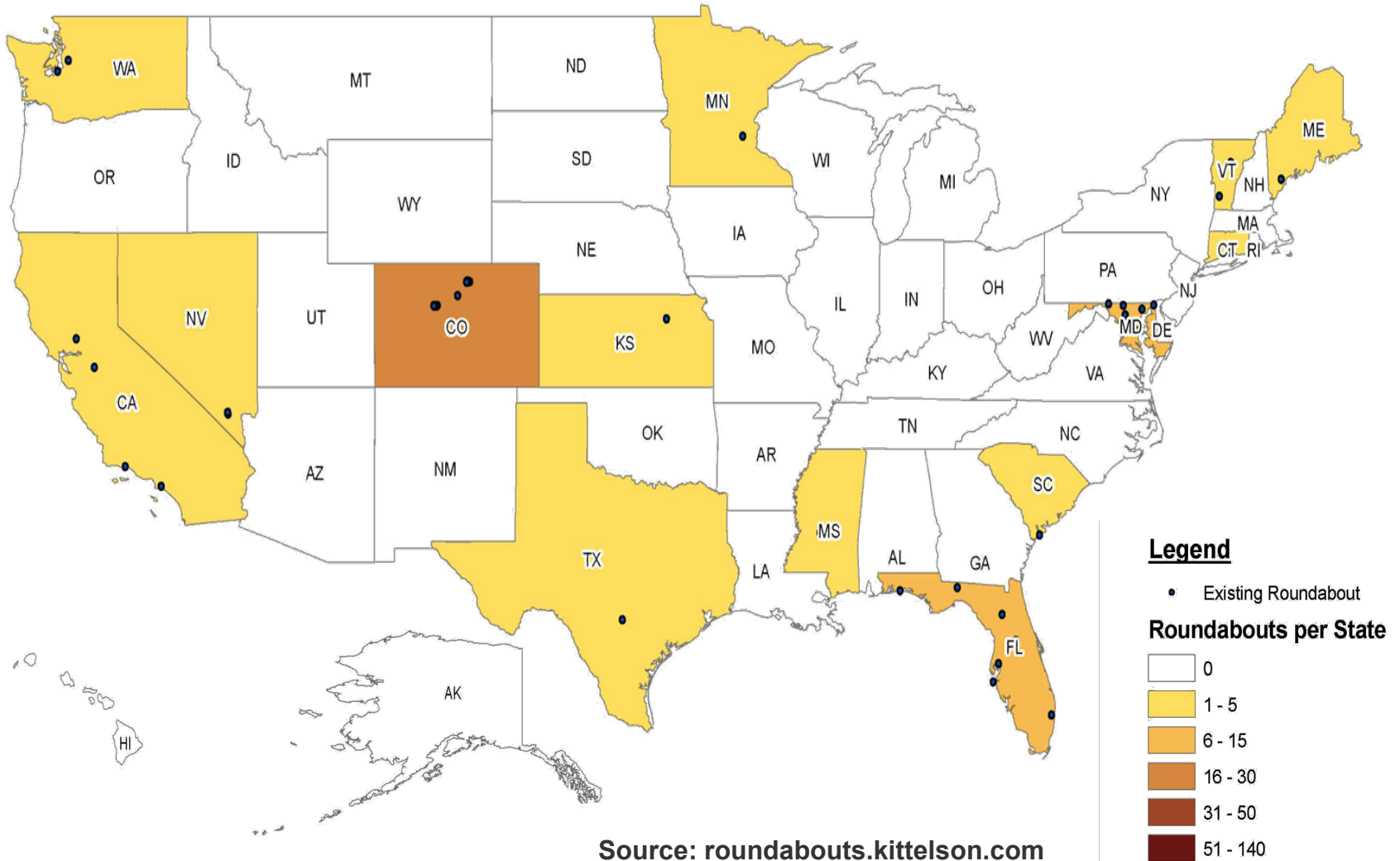


# U.S. sites by state through 1992



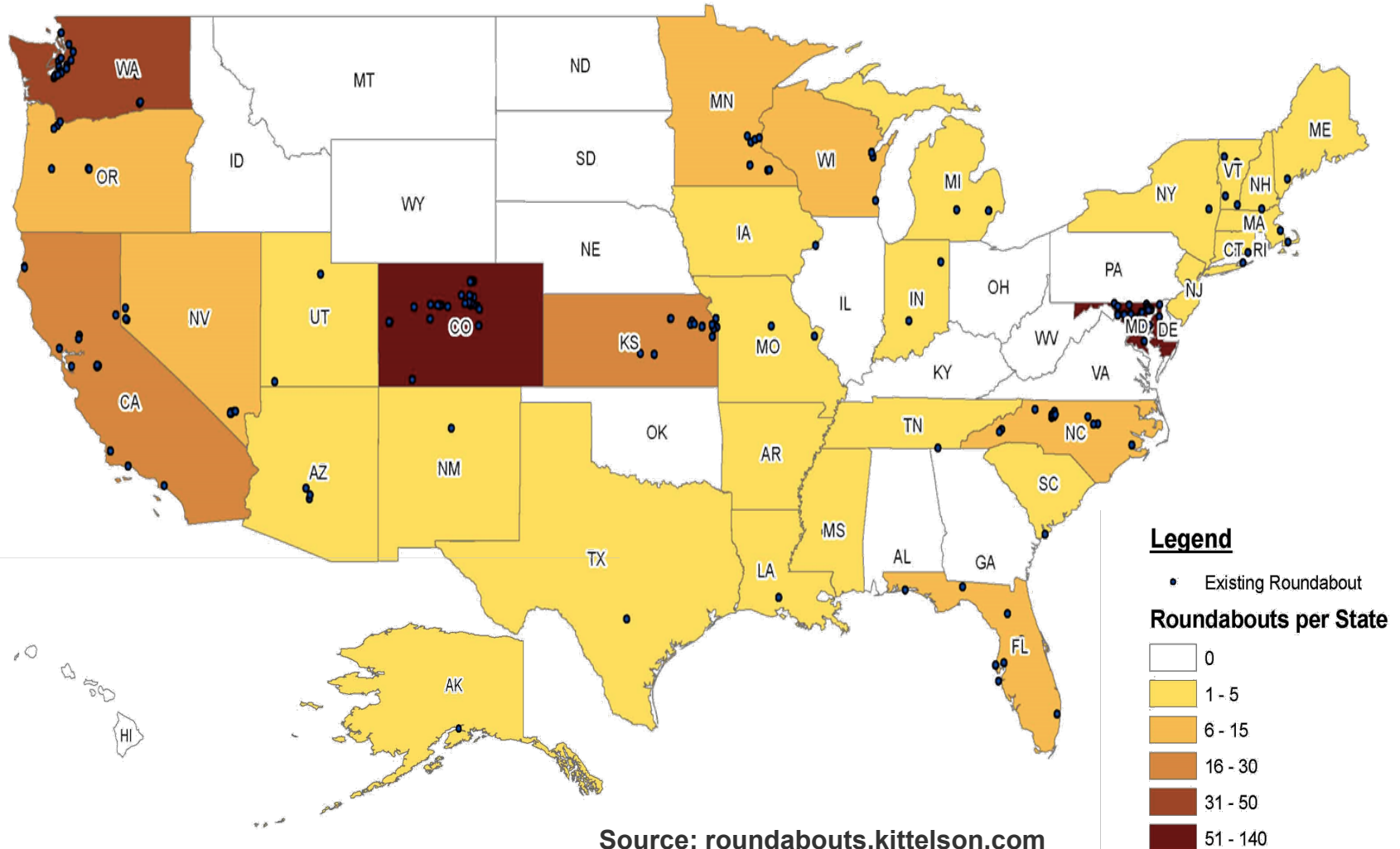
Source: [roundabouts.kittelson.com](http://roundabouts.kittelson.com)

# U.S. sites by state through 1997

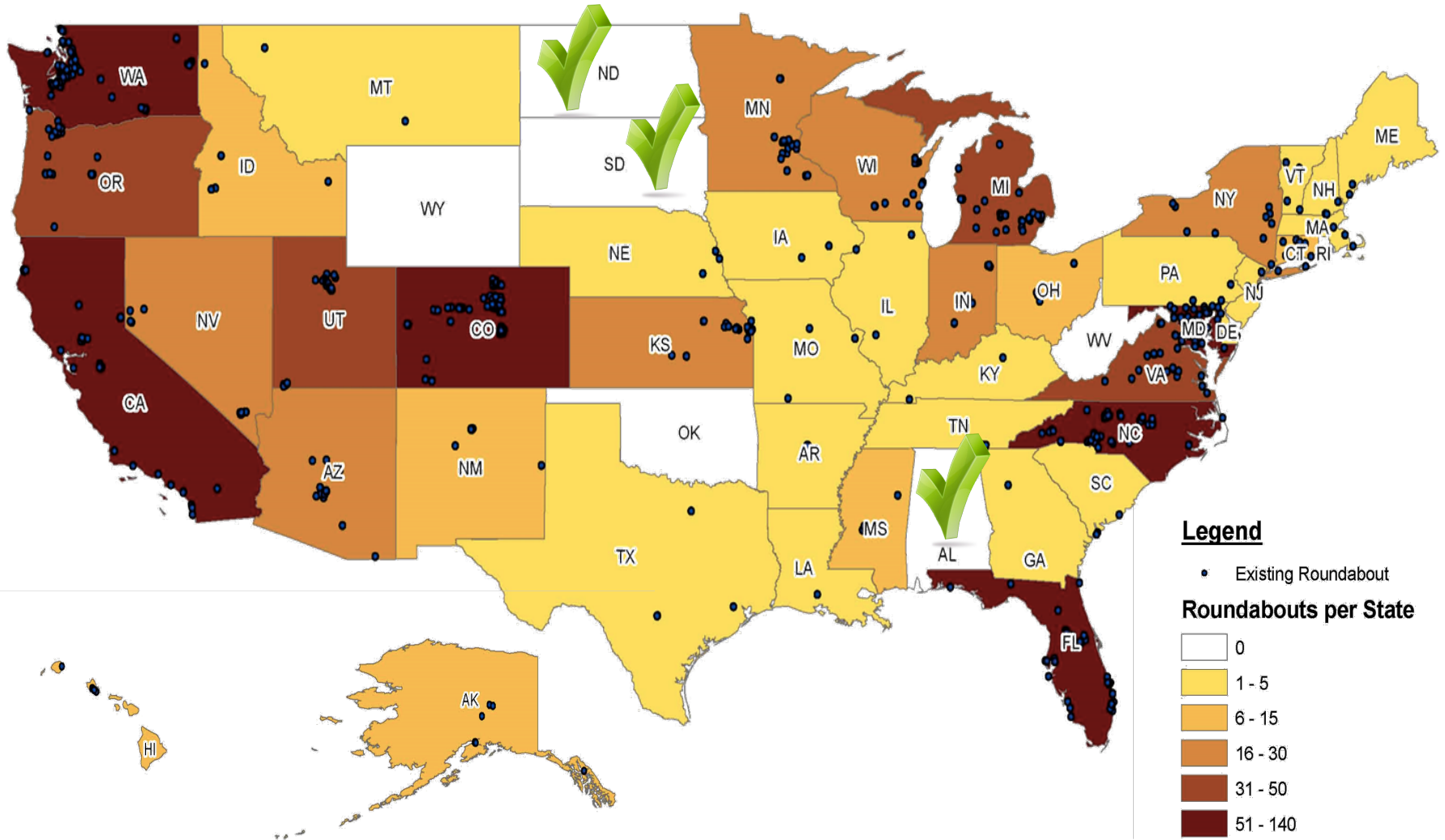




# U.S. sites by state through 2002



# U.S. sites by state through 2007 +





## *Where have roundabouts been installed?*

Tourist Routes -  
Astoria, Oregon



Large Developments - South  
Jordan, Utah



Snowy Locations - North  
Pole, Alaska



Near Schools -  
Clearwater, Florida



Photos: Lee Rodegerdts



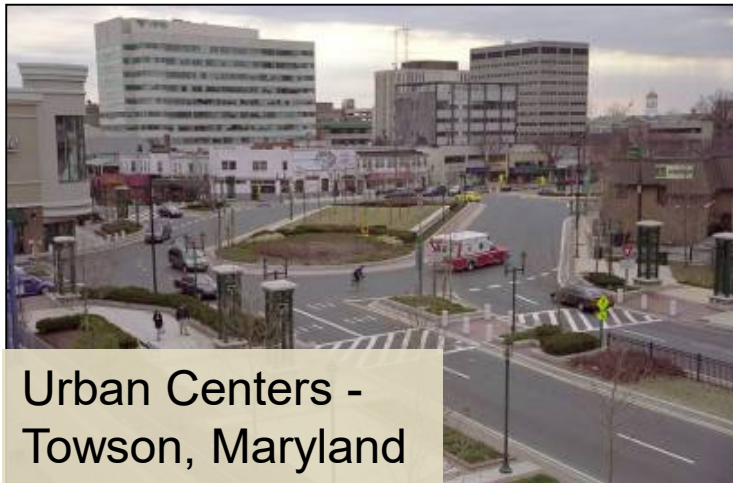
## *Where have roundabouts been installed?*



Residential Subdivisions  
- Modesto, California



Small Towns -  
Howard, Wisconsin



Urban Centers -  
Towson, Maryland



High-Speed, Rural Roadways  
- Paola, Kansas

# Roundabouts are being utilized under a wide variety of conditions



- Freeway interchanges
- High speed rural
- High volume conditions
- High pedestrians
- High truck volumes
- Awkward geometry
- Near schools
- “Gateways” into lower speed facility
- Light rail corridors



## ***Roundabouts in Oregon***

*(As of August 2010)*

• Bend	23 (2)	• Wash. Co.	2
• Springfield	5 (1)	• Beaverton	1
• Sherwood	3	• Albany	1
• Clack. Co.	3 (1)	• Astoria	1 (1)
• Lk Oswego	2	• Medford	1
• Madras	2	• Tigard	1
• Eugene	2	• Newberg	1
• Portland	2		

**Total: 50 (5)**

( ) = # of multi-lane roundabouts



# *Urban Single-Lane Roundabout Examples*



**Terwilliger/Palater  
Portland**



**Century/Colorado  
Bend**



## *Urban Multilane Roundabout Examples*



**Hayden Br. Way/ Pioneer Pkwy  
Springfield**



**Stafford/Borland  
Clackamas**





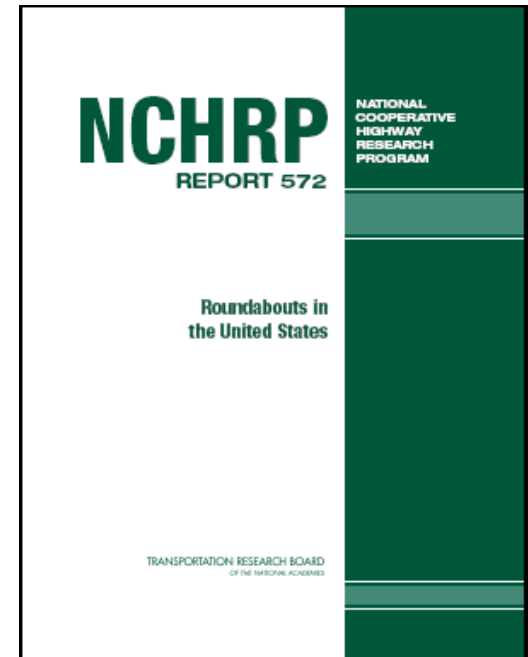
## ***Key roundabout advantages—Better use of Intersection Space and Time***

- Safety
- Delay
- Emissions
- Fuel Savings
- Aesthetics
- Flexible to low volumes/high volumes (doesn't require timing plans)



# ***NCHRP Report 572: Roundabouts in the U.S.***

- NCHRP Project 3-65
- Most comprehensive study of U.S. roundabout performance to date
- Safety and operational models based on U.S. field data
- Updated design guidance based on model findings and current state-of-the-art practice and thinking
- Completed May 2006





# ***Safety Performance***

## ***(NCHRP Report 572)***

- Over 90% reduction in fatalities
  - Some states 100% reduction so far
- 76% reduction in injuries
- 35% reduction in total crashes
- Very little reported pedestrian and bicycle crash experience



Photo: Lee Rodegerdts



## *Maryland's Roundabout Safety Experience (March 2007 Study)*

- **Overall Crash Reductions:**
  - 68% reduction in total crashes
  - 100% reduction in fatal accident rate
  - 86% reduction in injury accident rate
  - 41% reduction in property damage only accidents
- **Benefit/cost analysis indicated return of \$15 for every dollar spent in crash reduction alone.**



## ***Signalized Intersection Crashes in Oregon 2003 thru 2007 (5 yrs)***

- At 1240 Signalized Intersections on State Hwys
  - 32 Fatal crashes
  - 308 Serious Injury (Inj. A) crashes
  - 5171 Moderate & minor injury crashes
- Total crashes: approx 2 every year per int
- As speeds increase, % of crashes that are F & Inj A increase.  
(2.2% @ 20mph, 4.0% @ 45 & 50 mph)



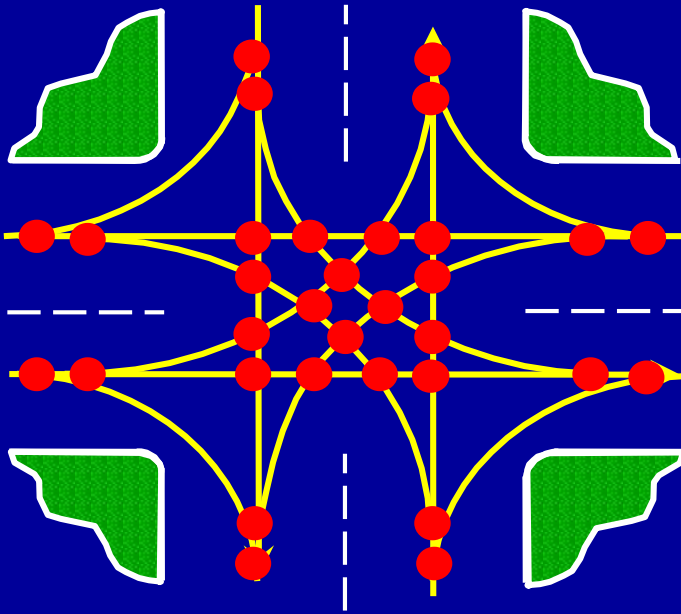
## ***Unsignalized Intersection Crashes in Oregon 2003 thru 2007 (5 yrs)***

- 11,004 Unsignalized Intersect'ns on St. Hwys
  - 105 Fatal crashes
  - 472 Serious Injury crashes
  - 4347 Moderate & minor injury crashes
- Total Crashes: 1 every 5 yrs per intrsctn.
- % of crashes that are F & Inj A increase as speeds increase.  
(2.0% @ 25mph, 10.8% @ 50 mph)



*Why are roundabouts safer? The laws of physics!!!*

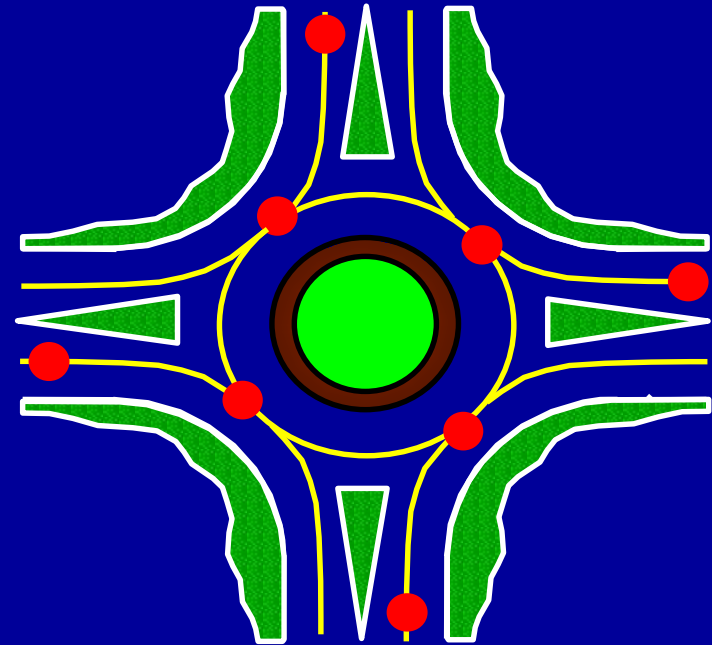
## *Comparison of Vehicle Conflict Points*



32 conflict points

- High-speed
- High-angle
- **High-energy**

**75% fewer  
conflicts**



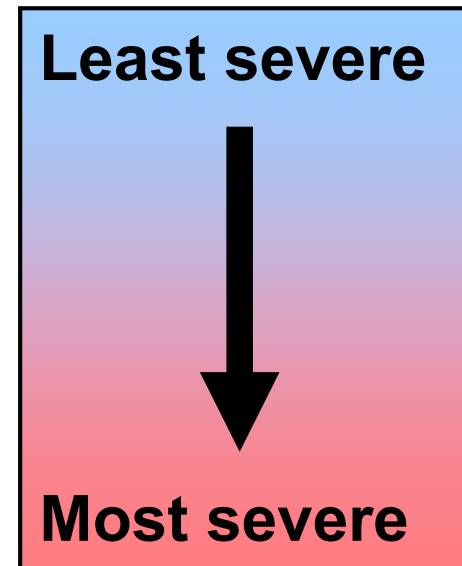
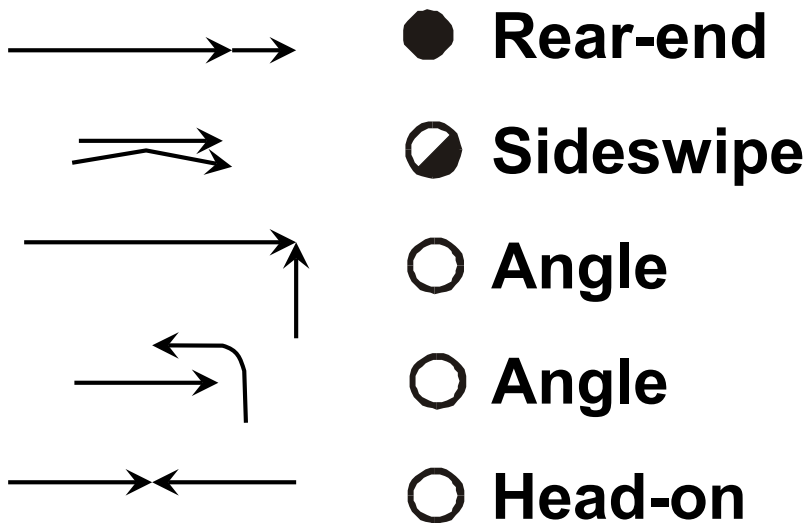
8 conflict points

- Low-speed
- Low-angle
- **Low-energy**



# ***Severity of Vehicular Conflicts:*** ***REDUCED***

- Severity related to relative velocities of conflicting streams

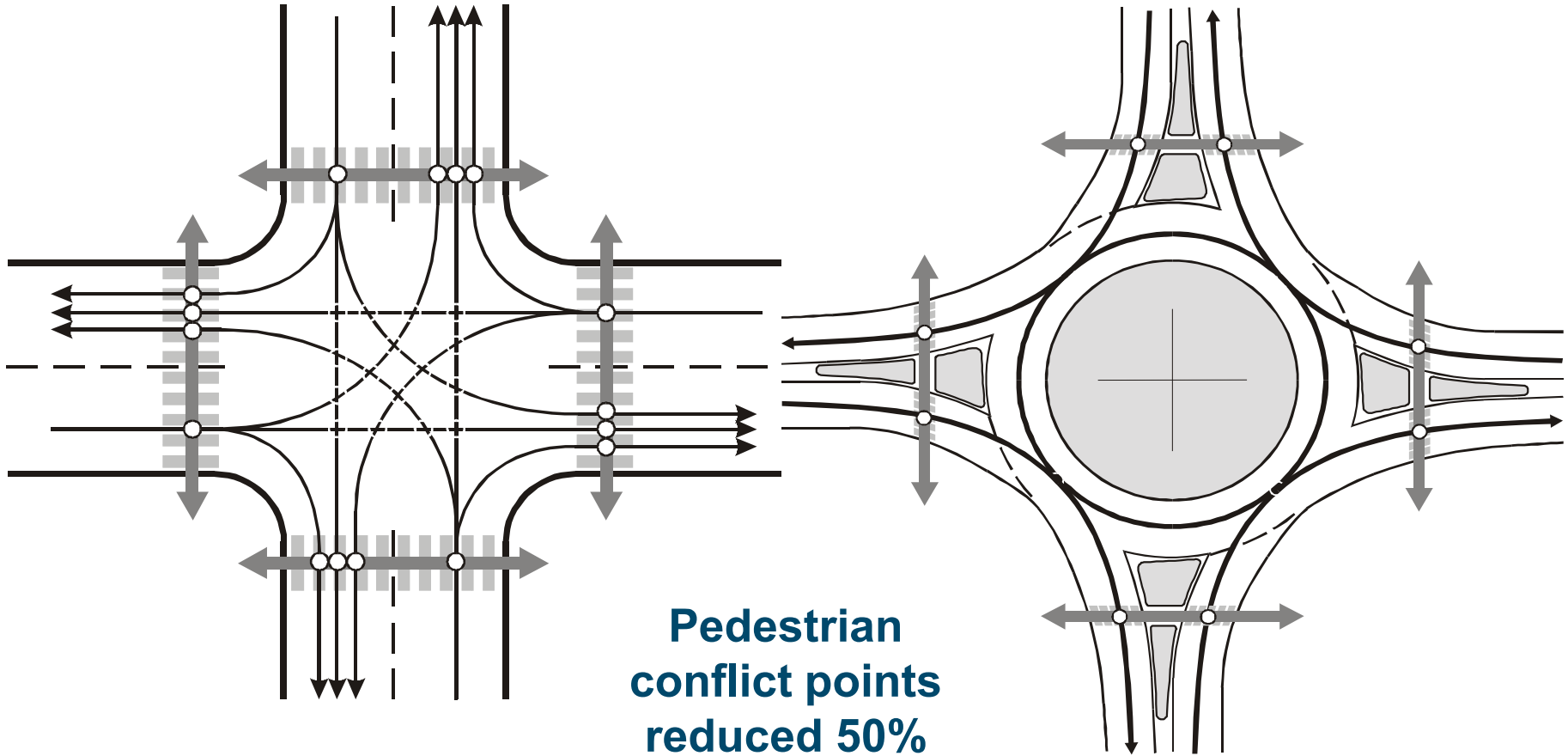






# ***Pedestrian Conflict Points: REDUCED***

○ Vehicle/Pedestrian Conflicts



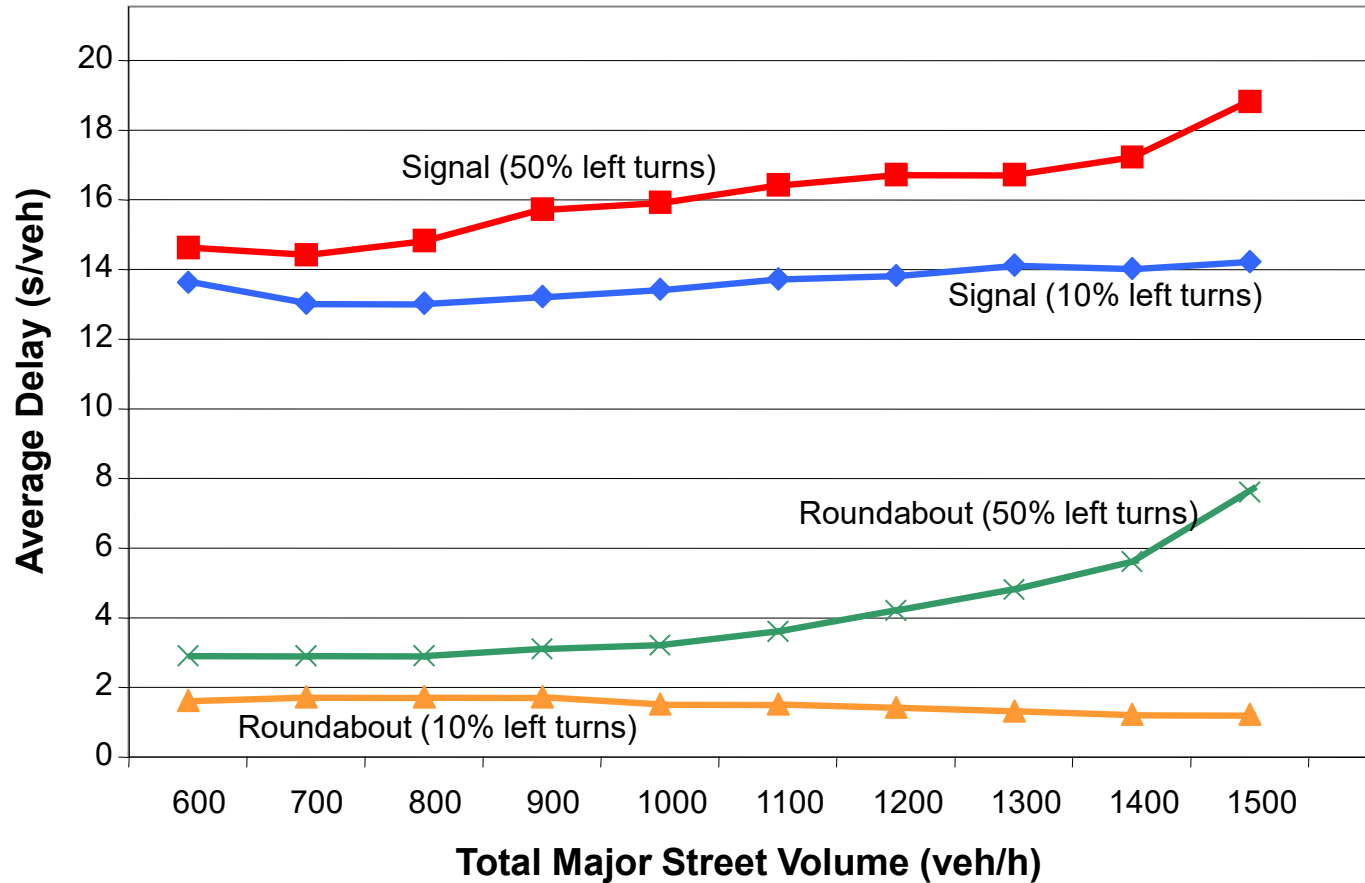


## ***Roundabouts Reduce Delay***

- At 3 sites in NH, NY, & WA where signals or stop signs were replaced w/ roundabouts there were reductions of 89% in delay and 56% in vehicle stops.
- At 11 intersections in Kansas reductions of 65% and 52% in delays and vehicle stops.



# Roundabouts versus Signals: MUTCD Signal Warrant Threshold



**Lower Delay =  
Lower Emissions**



## ***Roundabouts Save Fuel & Reduce Emissions***

- At least two studies have noted that roundabouts can reduce fuel consumption by about 30%.
- In one study replacing a signal with a roundabout reduced CO emissions by 29% and Nitrous Oxide emissions by 21%
- Another study noted reductions of 34% NO, 32% CO, 37% CO<sub>2</sub> & 42% in hydrocarbons in replacing traffic signals and stop signs



## ***Roundabout Issues***

- Public Acceptance
- User Consideration
  - Design Vehicles
  - Pedestrian & ADA questions (at multi-lane RDBTs)
  - Bicycles
  - Emergency Vehicles
- Uneven Volumes or Lanes
- Continued education for public and professionals
- Continued development of standards, policies, & guidance



# Public Attitude Toward Roundabouts Before And After Their Construction

<b>Attitude</b>	<b>Before Construction</b>	<b>After Construction</b>
• <b>Very Negative</b>	<b>23%</b>	<b>00%</b>
• <b>Negative</b>	<b>45%</b>	<b>00%</b>
• <b>Neutral</b>	<b>18%</b>	<b>27%</b>
• <b>Positive</b>	<b>14%</b>	<b>41%</b>
• <b>Very Positive</b>	<b>0%</b>	<b>32%</b>

Source: NCHRP Synthesis 264



# *Design vehicle: Can design for any vehicle*



Truckee, California

Portland, Oregon



Photos: Lee Rodegerdts



# *Design for Appropriate Design Vehicle: Critical at Planning Stage*



Good design

- May require use of truck apron
- Affects diameter and right-of-way requirements



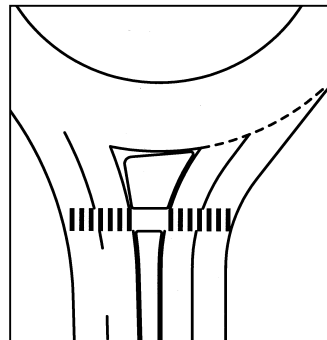
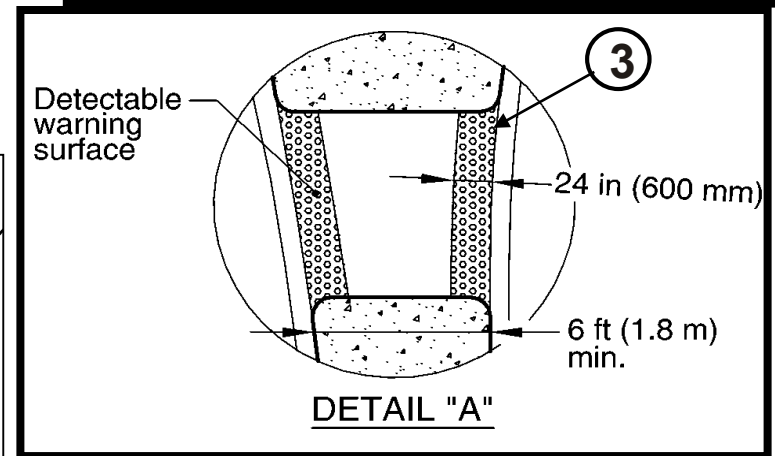
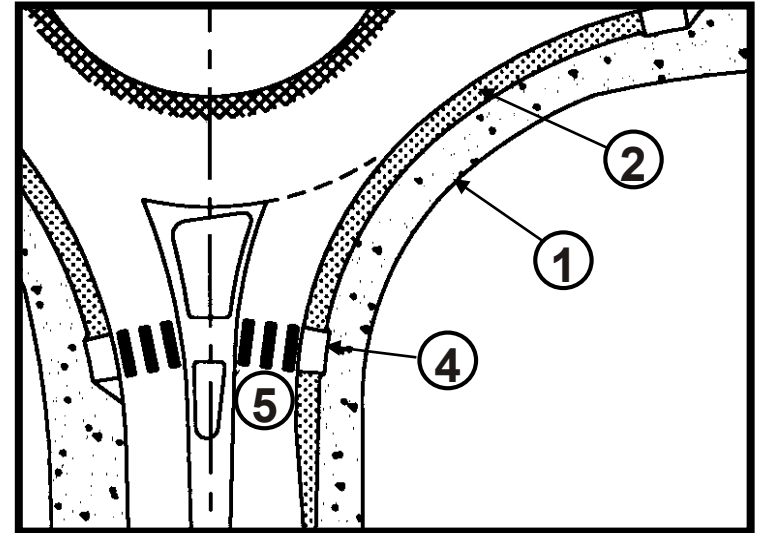
Poor design





# ***Pedestrian Design Guidance***

1. Well defined walkway edges
2. Separated walkways
3. Detectable warnings
4. Perpendicular crossings
5. Contrasting crosswalk markings



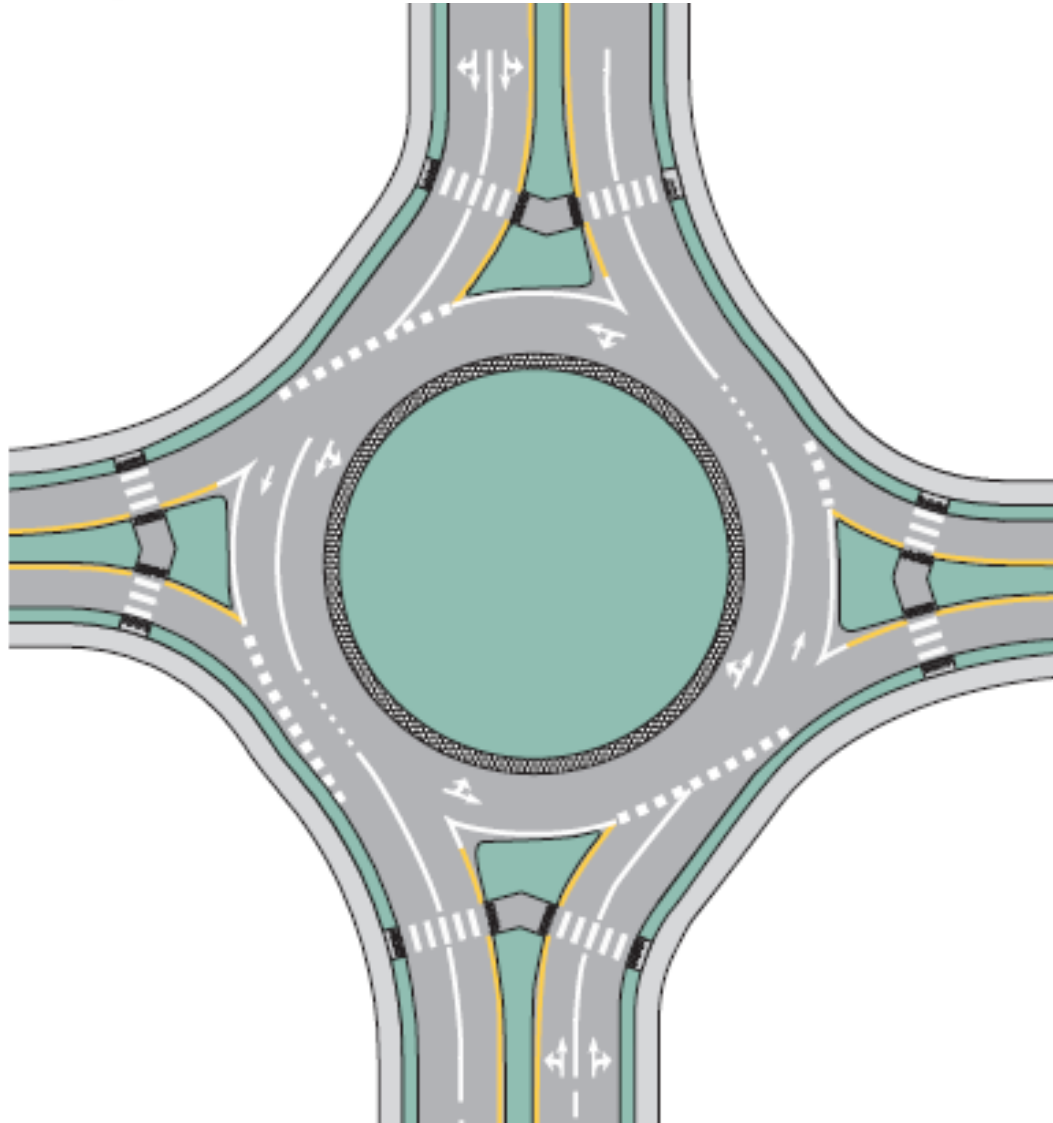


## ***Lane numbers and assignments***

- Each entry, exit, and section of circulatory roadway should have the appropriate number of lanes, properly assigned
- Geometric design, signing/striping, and operational analysis need to agree
- OK to have mixture of single- and multi-lane entries

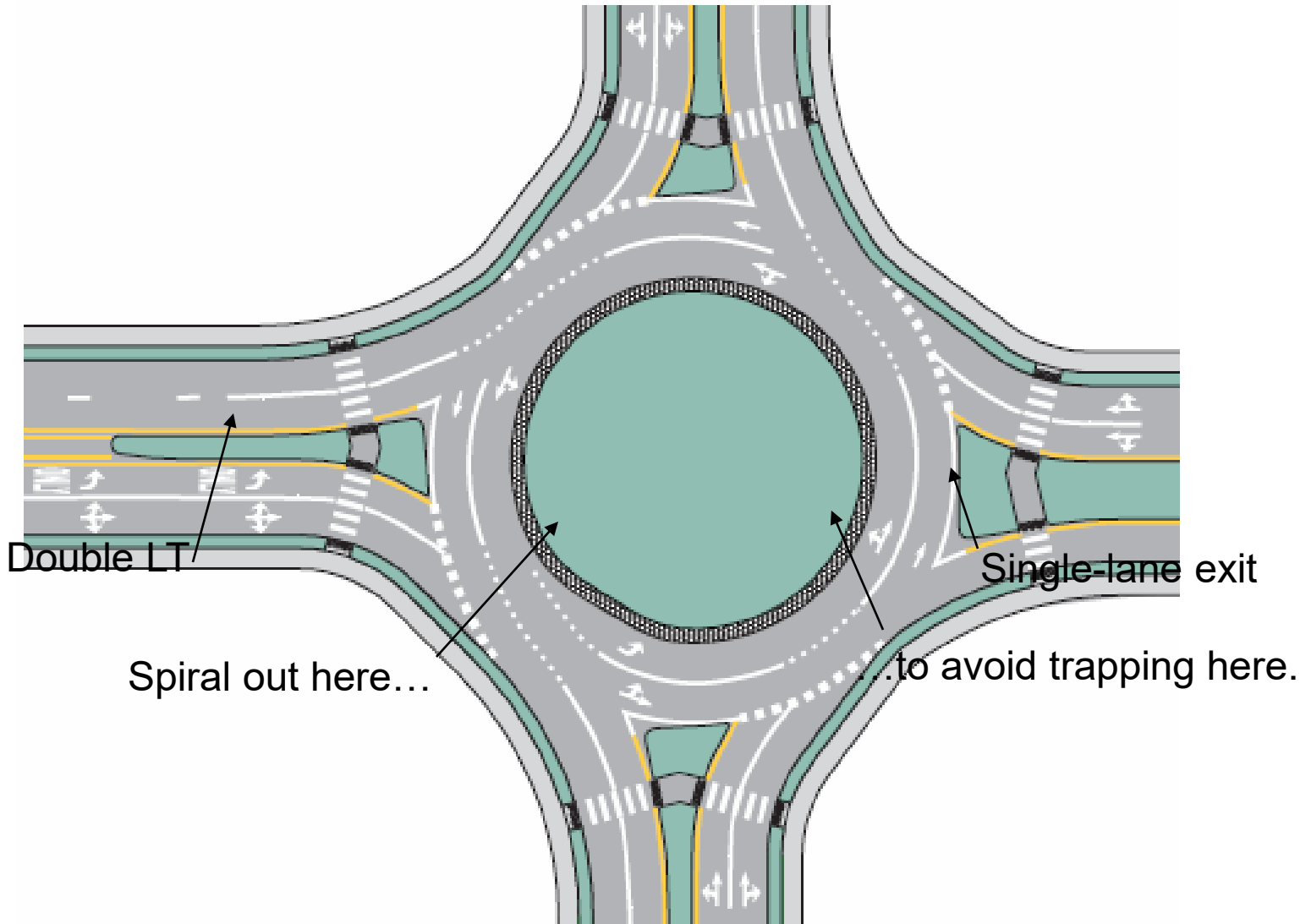


# *Example of 2-Lane with 1-Lane Side Street*





## *2-Lane Rdbt with Double-Left Turn*





# Roundabouts: A Safer Alternative

## End Session 1

Springfield, Oregon