

Current Roundabout Practice in the United States

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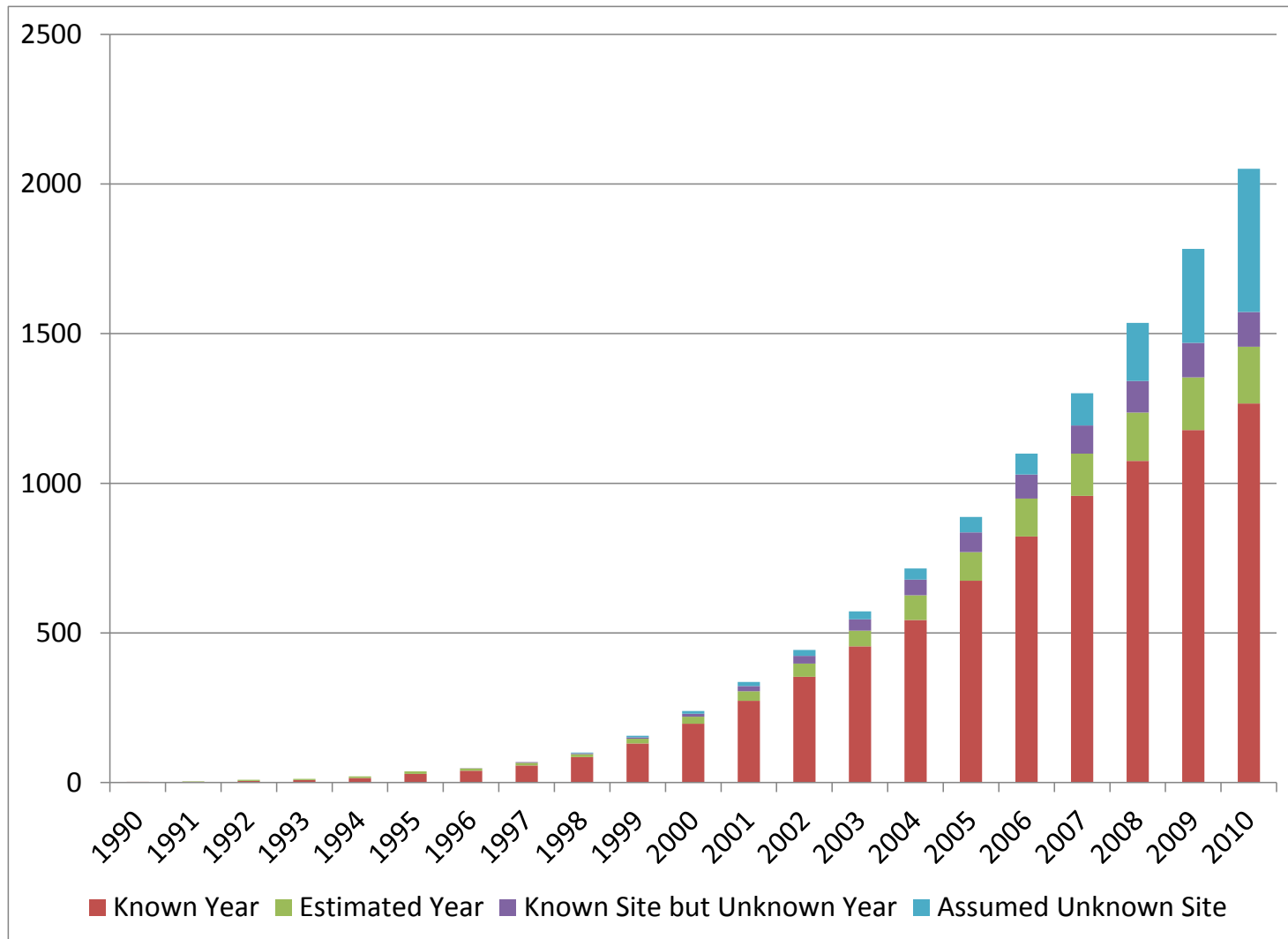
Current Roundabout Practice in the United States

- › Current Status
- › Capacity Issues
- › Design Issues
- › Future Direction



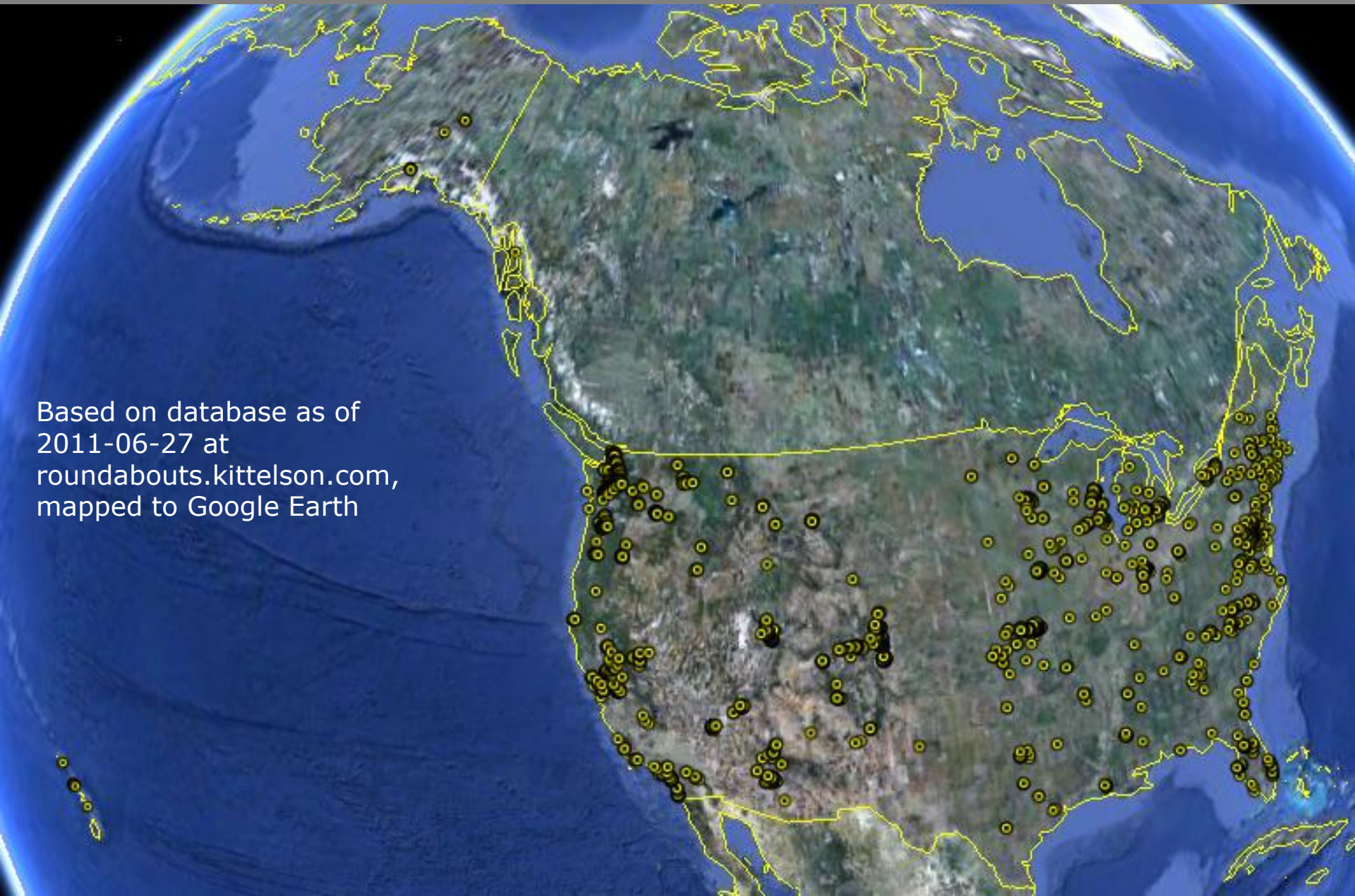
Photo: Lee Rodegerdts

Over 2,000 Roundabouts in US through 2010



Roundabouts Built in All 50 US States

Based on database as of
2011-06-27 at
roundabouts.kittelson.com,
mapped to Google Earth



Variety of Roundabout Uses



Variety of Roundabout Uses (cont.)

**Tourist Routes -
Astoria, Oregon**



**Large Developments -
South Jordan, Utah**



**Northern Climates -
North Pole, Alaska**

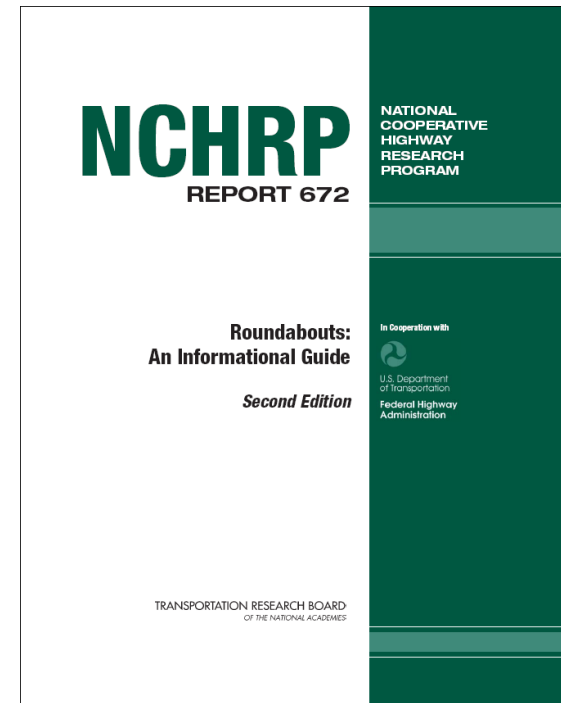


**Near Schools -
Clearwater, Florida**



Primary Guidance Documents

- › NCHRP Report 672, Roundabouts: An Informational Guide, Second Edition
- › Highway Capacity Manual
- › Highway Safety Manual
- › Manual on Uniform Traffic Control Devices
- › Policy on Geometric Design of Highways and Streets
- › Public Rights of Way Accessibility Guidelines
- › Roundabout Lighting Design Guide



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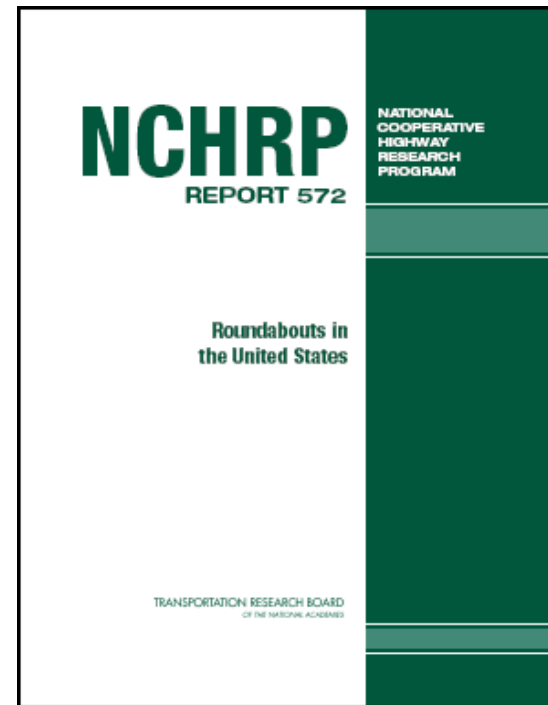
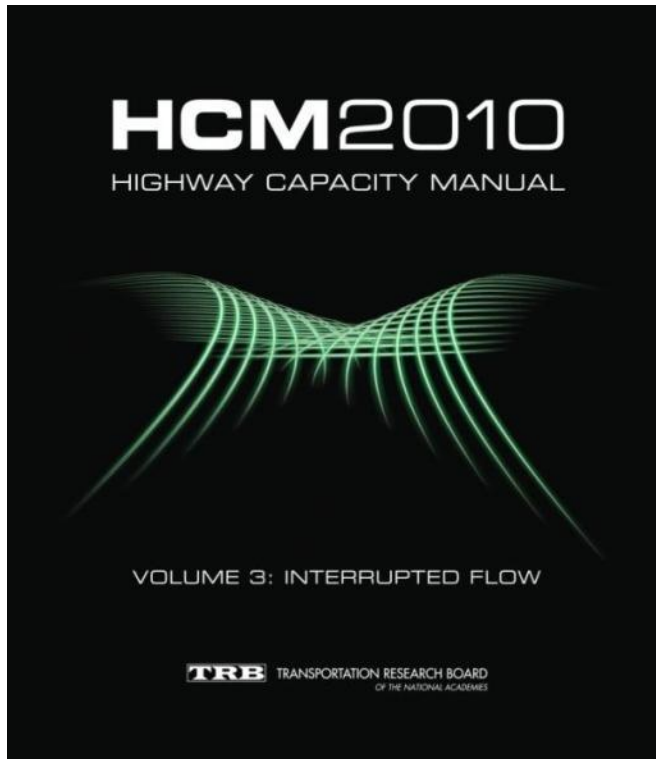
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Photo: Lee Rodegerdts

Capacity Issues

- › New analysis procedure in HCM 2010
- › Anchored to research in NCHRP Report 572



Key Operational Findings from NCHRP Report 572

- › U.S. capacities lower than observed in other countries
- › Capacity clearly sensitive to geometry in the aggregate (number of lanes)
- › Secondary effects of geometry on capacity (e.g., lane width, diameter) masked by variations in driver behavior
- › Lane-by-lane analysis needed

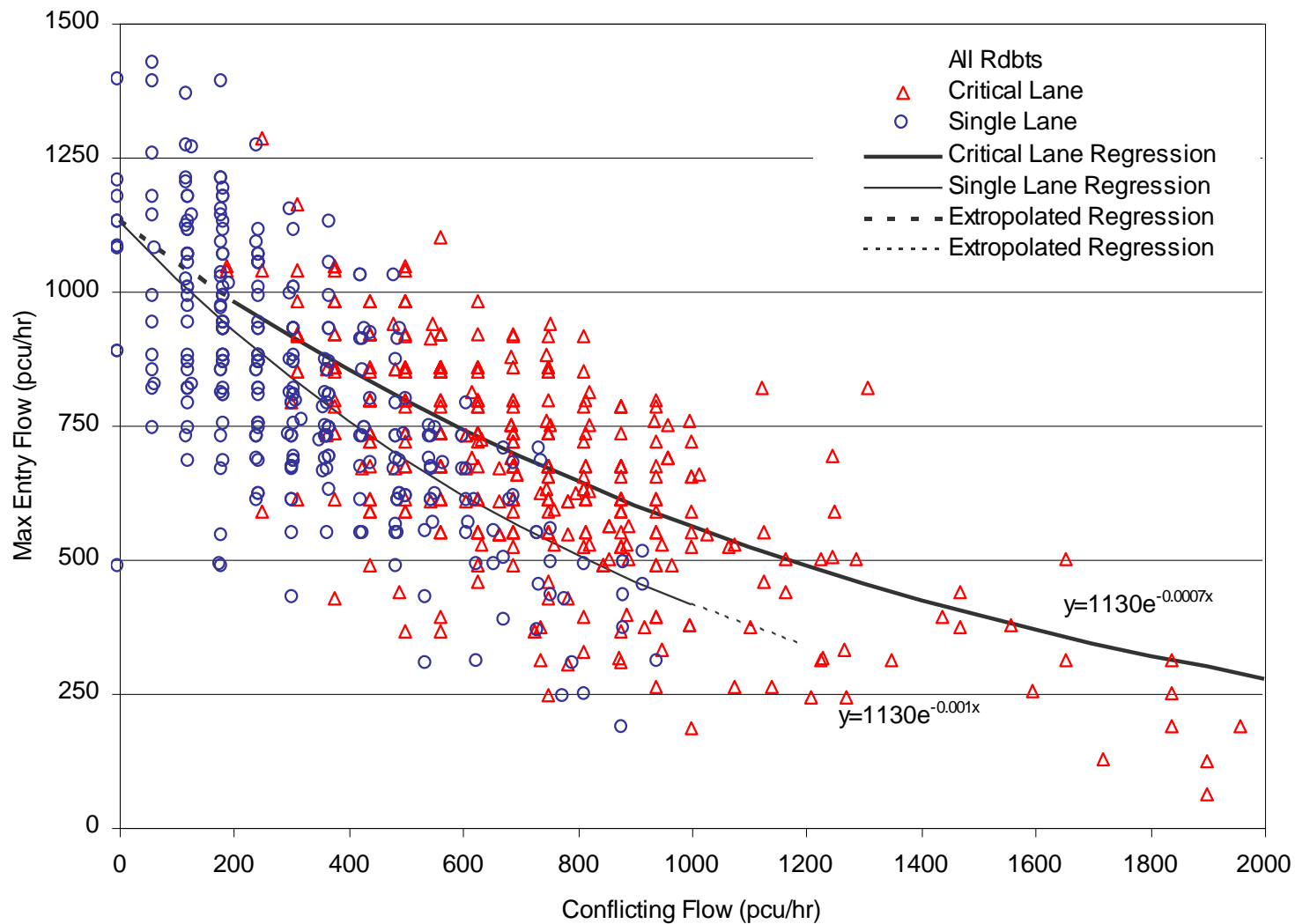


Possible Reasons for Lower U.S. Capacities

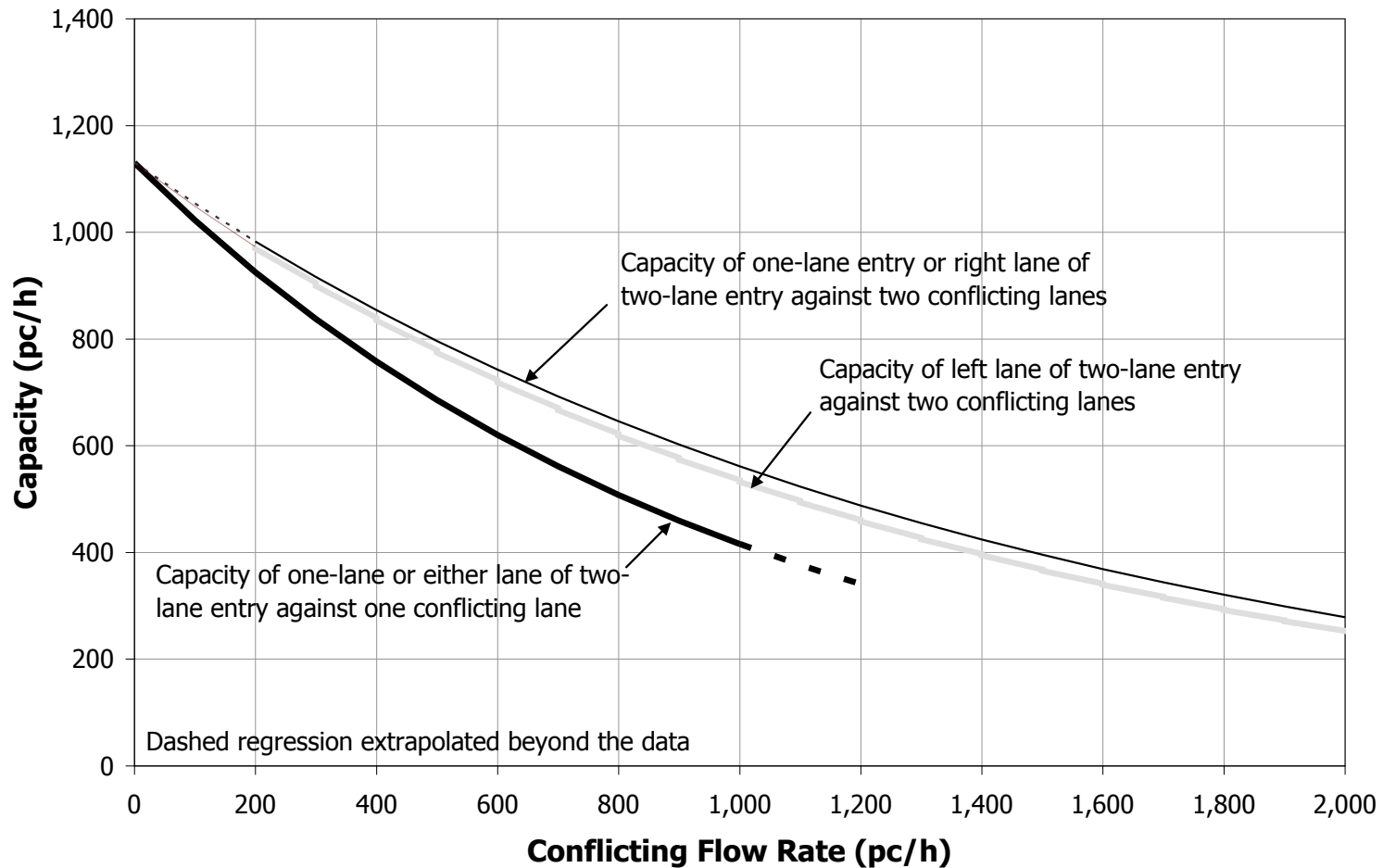
- › Driver unfamiliarity with roundabouts
 - › Larger vehicles
 - › Prevalence of stop control
 - › Lack of use of turn signals on exits
 - › Suboptimal geometry affects lane use at multilane roundabouts
-
- › Trends may change over time or by region
 - › Need for ability to calibrate model



NCHRP Report 572 Capacity Curves



HCM 2010 Capacity Analysis



Calibration of Capacity

- › Form of empirical regression model allows for direct calibration to local field conditions

$$c_a = Ae^{(-Bv_c)} \quad A = \frac{3600}{t_f} \quad B = \frac{t_c - (t_f / 2)}{3600}$$

- › t_c = critical headway, t_f = follow-up headway

Single-Lane Roundabouts	NCHRP 572 (2003 data)	California (Tian et al, 2006)	Bend, Oregon (KAI, 2009)
Critical Headway	5.1 s	4.8 s	4.1 s
Follow-up Headway	3.2 s	2.5 s	2.7 s

Control Delay and Level of Service

$$d = \frac{3,600}{c} + 900T \left[x - 1 + \sqrt{(x - 1)^2 + \frac{\left(\frac{3,600}{c}\right)x}{450T}} \right] + 5 \times \min[x, 1]$$

where:

D = control delay, s/veh

x = volume-to-capacity ratio

c = capacity, veh/h

T = time period = 0.25 h

LOS	Control Delay (s/veh)
A	0 – 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50



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Philosophy of Roundabouts: An Informational Guide

- › Principle-based approach
- › Recognizes roundabouts, as with any intersection treatment, requires the balancing of competing objectives
- › Flexibility is provided to encourage independent designs and techniques
 - *Tailored to particular situations*
 - *Emphasizes performance-based evaluation of designs*
 - *Allows development of new techniques*
- › More than one way to achieve an acceptable design

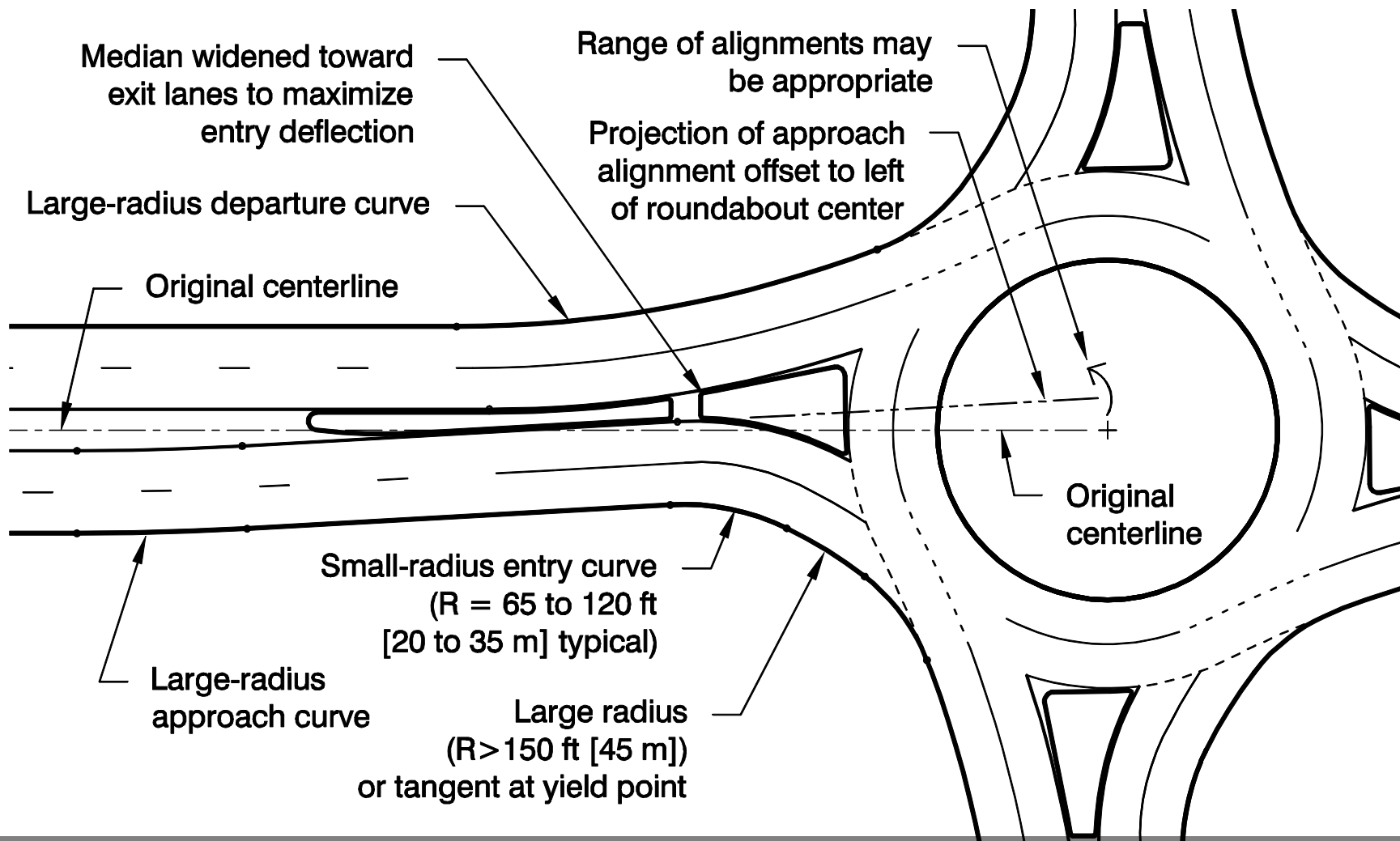
Issues Related to Trucks

- › Larger trucks more common (WB-20/WB-67)
- › Concerns over accommodating oversized loads (e.g., wind turbines)
- › Concerns over side-by-side travel in multilane roundabouts



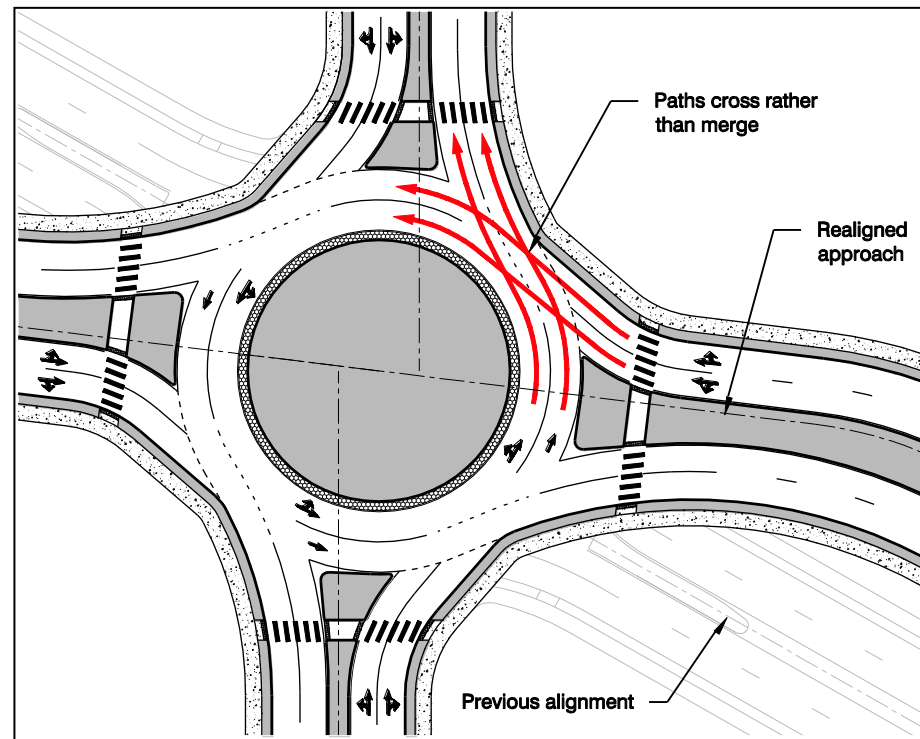
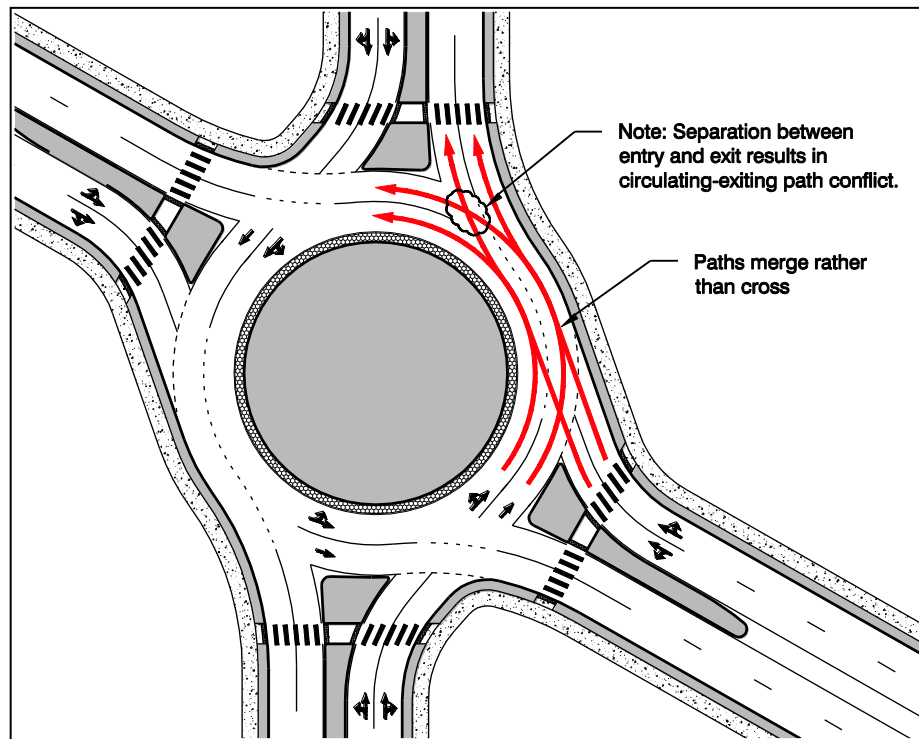
Photo: Lee Rodegerdts

Promoting Good Path Alignment at Multilane Roundabouts

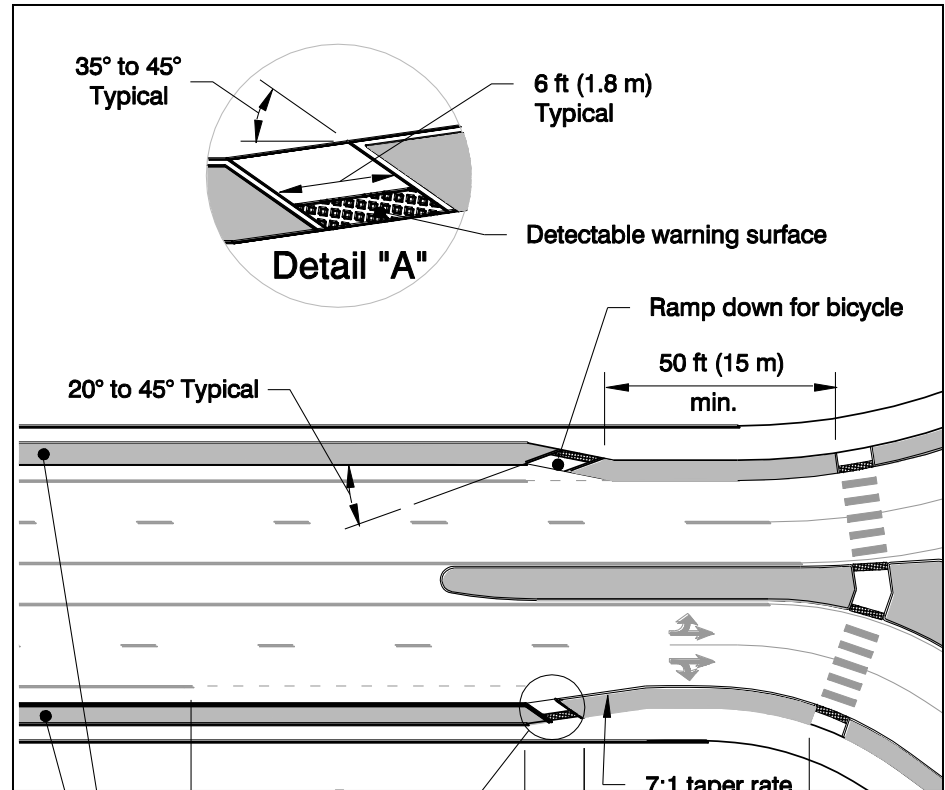
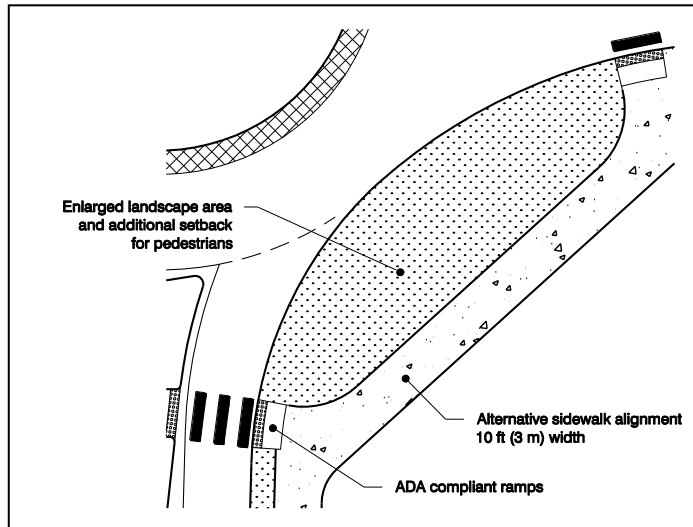
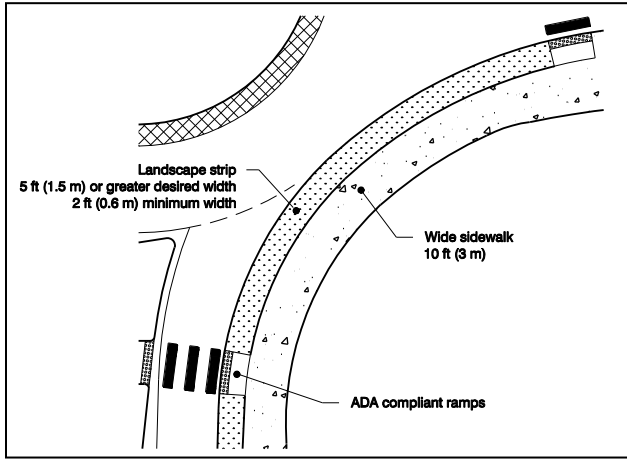


Managing Conflict Areas at Multilane Roundabouts

- › Desire to minimize likelihood of vehicles entering next to exiting vehicles



Pedestrian and Bicycle Treatments



Treatments Tested in NCHRP Report 674 for Improving Accessibility to All Pedestrians



Raised Crosswalk

Pedestrian Hybrid Beacon



Photos: Lee Rodegerdtis

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Ongoing Research Activities

- › Accommodation of oversized trucks (“superloads”)
- › Practices for accommodating standard trucks at multilane roundabouts
- › NCHRP Project 03-100: Analysis of roundabouts in corridors
- › FHWA study of mini-roundabouts

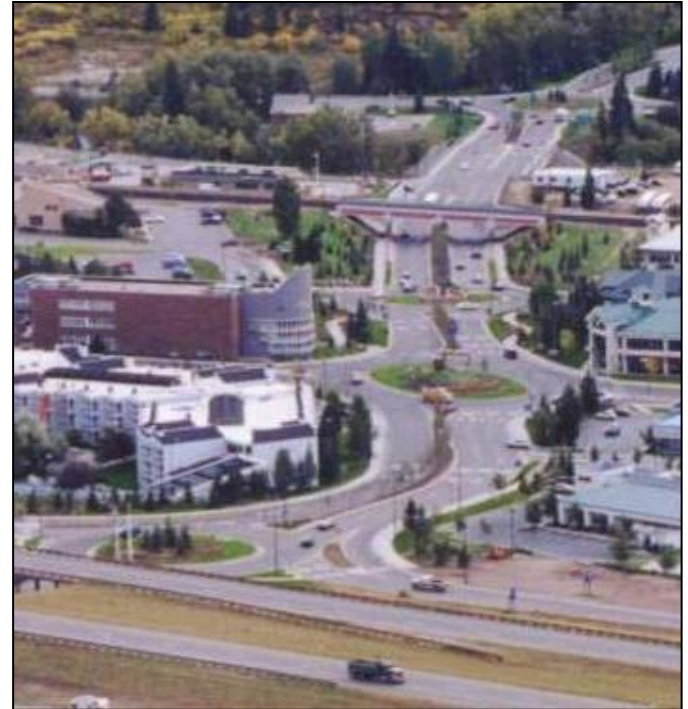


Photo: Lee Rodegerats

Upcoming Research Activities

- › FHWA research on four topics:
 - *Effectiveness of Rectangular Rapid Flashing Beacon (RRFB) at multilane roundabout pedestrian crossings*
 - *Calibration and update of capacity models*
 - *Assessment of environmental models (air quality, noise)*
 - *Assessment of fatal and severe injury crashes*
- › NCHRP Project 03-78b: Further evaluation of treatments for accommodating pedestrians with vision disabilities

Thank you!

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