2017 M.S Project Presentation

ROAD DIET V2.0

YOUR SPEAKER

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EDUCATION
B.S. Computer Science M.S. Electrical Engineering *M.S. Civil Engineering

EXPERIENCE
R&D – Biomedical Engineering
Public Works General Contracting, California
Active Transportation

INTERESTS
Safe Streets Road Diets Roundabouts Advisory Bike Lanes

STANDARD ROAD DIET

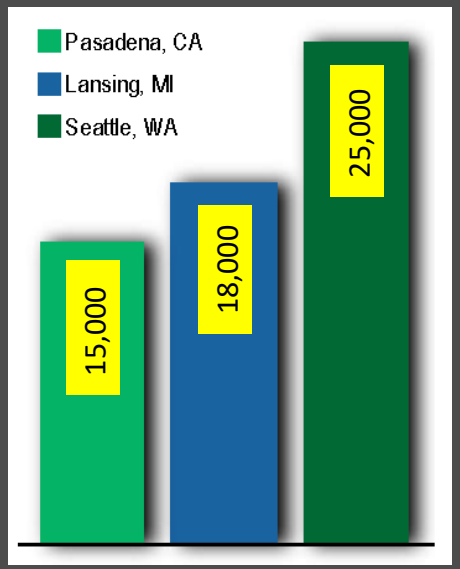
The re-configuration of pavement markings to transform a 4-lane, undivided road (two through lanes in each direction) to a 3-lane road (one through lane in each direction separated by a two way left turn lane or TWLTL).

Photos Courtesy FHWA Road Diet Informational Guide (FHWA-14-028)

STANDARD ROAD DIET

ADVANTAGES/APPLICABILITY

- Applicable to corridors with up to 25,000 ADT
- Little capacity reduction on de-facto corridors
- Increased safety for all users
- Liberated ROW
- Livability



Maximum Volume for Road Diet (ADT)

Diagram Courtesy of FHWA-14-028

STANDARD ROAD DIET

DISADVANTAGES/INAPPLICABILITY

- Short blocks, Signal timing, intersection capacity
- Capacity reduction on through corridors
- TWLTL and intersection safety
- Liberated ROW can be minimal
- Higher ADT corridors

STANDARD ROAD DIET

CAN WE GO ONE STEP, OR ONE LANE, FARTHER?

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- No new elements
- Successful projects exist all over U.S.
- Guidance and acceptance lacking

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CORRIDOR CHARACTERISTICS

- Roundabouts at all (major) intersections
- Two-lane road, one lane in each direction
- No left turns – U-turn followed by right turn
- Raised median

We discuss only

- Single-lane roundabouts
- 2-lane roads

Photo Courtesy roundabouts.net

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ADVANTAGES

- Potentially dramatic safety impacts for all
- Liberated ROW
- Go slower, get there faster
- Reduced speed – livability, place-making, commerce
- Short blocks, signal timing – no problem!

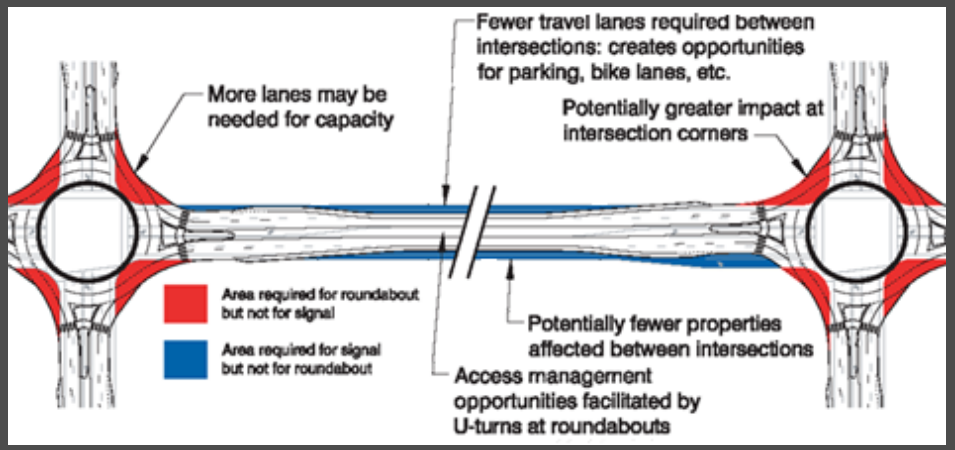

Diagram from 2010 NCHRP 672 Roundabouts: An Informational Guide

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DISADVANTAGES/ISSUES

- Larger vehicles in constrained roundabouts
- Emergency vehicles, public buses
- Capacity dependent on left and U-turn rates
- Capacity dependent on familiarity with roundabouts
- Ability to pass – transit, freight
- Corridor friction

Photo Courtesy of Blue Zones

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FEASIBILITY ASSESSMENT

How does an agency know if RD2.0 is worth pursuing?

TWO QUESTIONS

1. ROW for Roundabouts?
2. Supportable Traffic Volumes?

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1. ROW FOR ROUNDABOUTS?

Roundabouts per 2000 FHWA Roundabouts Informational Guide

- Urban Compact
  80-100 foot ICD 15,000 veh/day on all 4 legs
- Urban Single-lane
  100-130 foot ICD 20,000 veh/day on all 4 legs

Procedure for Creating Roundabout Template Diameter

- Measure a number of examples of each, calculate mean diameter
- Include sidewalk and landscaping – true size, not ICD
- No roundabouts had separated bicycle facilities to include

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2. SUPPORTABLE TRAFFIC VOLUMES?

CONSIDERED APPROACHES FOR VOLUME ESTIMATION

1. Simulation
   Resource intensive, well-targeted solution but difficult to generalize

2. Formulaic Estimation using HCM Models
   Rbt capacity formulas don't consider corridors or familiar drivers

3. On-the-Ground Data
   Extrapolate from rbt corridor traffic data (LOS D or E)

Because good data was available, #3 was chosen.

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DATA

NCHRP 772 Evaluating the Performance of Corridors with Roundabouts (2014)

From set of roundabout corridors in U.S., chose those with:

- ≥ 3 roundabouts in series,
- 2-lane segments (no left turn lanes),
- Single lane roundabouts only, and
- Didn't include a pair of roundabouts servicing a highway interchange.

Six Corridors

- La Jolla Blvd, San Diego, CA
- Hagen Ranch Rd, Boynton Beach, FL
- Maple Island Rd, Springfield, OR
- O'Neill Dr, San Juan Capistrano, CA
- W. 8th Ave, Chico, CA
- Via Bella St, Williamsport, PA

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ROUNDABOUT CHARACTERISTICS							
Corridor Name	Roundabout	Diameter (Feet)	Width @ Crosswalk (Feet)	ICD Center to Crosswalk Center (Feet)	ICD* (Feet)	Distance from ICD edge to Crosswalk (Feet)	Roundabout Type per 2000 FHWA Guide
La Jolla Blvd	Camino De La Costa	105	54	88	92	42	Urban Compact
	Bird Rock Avenue	110	84	88	95	40.5	Urban Compact
O'Neill Dr	Eaton Place	170	97	93	136	25	Urban Single Lane+
	Senna Parkway	144	87	89	125	26.5	Urban Single Lane
W. 8th Ave	Greenwich Drive	105	48	75	98	26	Urban Compact
	Magnolia Avenue	115	71	70	97	21.5	Urban Compact
Hagen Ranch Rd	Majestic Palm Drive	175	81	117	145	44.5	Urban Single Lane+
	Le Chalet Boulevard	148	83	78	103	26.5	Urban Single Lane
Maple Island Rd	International Way	140	79	80	110	25	Urban Single Lane
	East Game Farm Road	138	68	79	111	23.5	Urban Single Lane
Via Bella	Court Street	156	68	97	133	30.5	Urban Single Lane+
	Mulberry Street	159	77	98	134	31	Urban Single Lane+
Average		138.8	74.8	87.7	114.9	30.2	
Median		142	78	88	110.5	26.5	
Maximum		175	97	117	145	44.5	
Minimum		105	48	70	92	21.5	

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2. SUPPORTABLE TRAFFIC VOLUMES?

La Jolla Boulevard, San Diego, CA

Photo Courtesy of San Diego Union Tribune

5-lane road 22,000 ADT at 40 – 45 MPH segment of Hwy 101

Residents/Businesses demanded better and got it in 2008

Photo Courtesy of San Diego Union Tribune

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2. SUPPORTABLE TRAFFIC VOLUMES?

La Jolla Boulevard, San Diego, CA

Photo Courtesy of San Diego Union Tribune

Bike lanes 23,000 ADT at 15 - 25 MPH 77% noise reduction

35% increase in trade dramatic decrease in fatalities

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2. SUPPORTABLE TRAFFIC VOLUMES?

La Jolla Boulevard, San Diego, CA – Volume?

- Measured Volumes

23,000 ADT with no congestion complaints
Peak 15 min volume = 583 => 2,332 veh/hr
1,166 veh/hr single lane

- Simulation Volumes

NCHRP 772 reports City rep claims 27,000 ADT possible in corridor simulations => 1,374 veh/hr single lane

*2007/2010 HCM rbt models peak at 1,130 veh/hr single lane!

2. SUPPORTABLE TRAFFIC VOLUMES?

High Volumes Possible Because

1. Low Left Turn & Minor Approach Volumes (7 - 10%)
2. Familiarity!

BUT DON'T FORGET!

- Volumes include friction from 62–118 pedestrians/hr and 13–30 cyclists/hr!
- Volumes include penalties for U-turn/Right turn and Left turn movements!
- Volumes include friction from on-street parking!

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ROW AND VOLUMES

	Turning & Minor Street Traffic Percentage	
	< 10% Left/U-Turn/Minor Traffic	> 10% Left & U-Turn/Minor Traffic
Desired Throughput		
Up to 25,000 veh/day	110’ (Urban Compact)	140’ (Urban Single-Lane)
Up to 30,000 veh/day	140’ (Urban Single-Lane)	Data Not Available

Note: Separated bike facilities are not included in these diameter measurements.

ROAD DIET V2.0 INFORMATIONAL GUIDE

alta
PLANNING + DESIGN

Road Diet

_____*Plus*

Michael Williams
June 10, 2017

ROAD DIET V2.0 INFORMATIONAL GUIDE

Mirrors the FHWA Road Diet Informational Guide

- Definition
- Benefits
- Tradeoffs
- Determination of Feasibility
- Design Issues
- Assessment

CONCLUSION

THANK YOU!

QUESTIONS?

ROUNDABOUT THROUGHPUT MODELS

2000 ROUNDABOUTS INFORMATIONAL GUIDE

p. 86 “As performance data become available for roundabouts designed according to the procedures in this guide in the United States, they will provide a basis for development of operational performance procedures specifically calibrated for U.S. conditions.”

2007 NCHRP 572

C = 1130 * exp(-0.0010*Vc) where

C = entry capacity (veh/hr) and

Vc = circulating traffic flow (pcu/hr).

HCM 2000 model

ROUNDABOUT THROUGHPUT MODELS

2010 NCHRP 672

C = 1130 * exp(-0.0010*Vc) where

C = entry capacity (pcu/hr) and

Vc = circulating traffic flow (pcu/hr).

2010 HCM Model – major update but not to maximum capacity, doesn't include geometric delay

2014 NCHRP 772

First work to model roundabout corridor capacity using Roundabout Influence Area Model

First geometric delay model for U.S. based on RIA