A Summary of Experiences with 3-Lane Roadway Conversions

Hennepin County, Minnesota

City of St. Paul, Minnesota

CENTER LANE ONLY
Issues with the term “Road Diet”

• Implies excess capacity, over-design and inefficiency

• Believe the issue is more one of proper context
  ➢ Traffic volumes
  ➢ Arrangement of accesses
  ➢ Response to an observed operational problem

• There is increased interest in 3-lane roads today – however these roads have been built since the mid-1970’s. They have just been one solution as part of the traffic engineer’s toolbox.

• Some advocacy groups and special interest organizations generally view 3-lane roads as being important for traffic calming, active living, and complete streets initiatives – occasionally, this has added a political overtone to the discussion.
Presentation Topic

• History of 3-Lane Roads
• Why the Recent Resurgence of Interest?
• Importance of Context
• Examples of 3-Lane conversions
• Before / After Findings
• Bike Lanes versus Shoulders
• Additional Considerations
• Other Issues / Summary
History of 3-Lane Roads

- Strong Interest in mid-1970’s
- Originally pursued for safety and operational reasons
- 3-Lane roads continued to be implemented in the 1980’s & 1990’s
  - Lexington Avenue (Roseville)
  - Hamline Avenue (Arden Hills)
  - Trunk Highway 244 (Mn/DOT)

- As traffic growth has continued, older 4-lane undivided roads have become more problematic
  - Relatively high vehicle crash rates
  - Speeding issues
  - Crosswalk and Trail crossing difficulties
  - Traffic growth leveling off in some areas – ability to reconsider
Why the Recent Resurgence of Interest?

- Perceived safety benefits
- Operational benefits
- Increasingly restricted right-of-ways
- Desire to bring speeds within posted limits
- Bicycle accommodation interests
- Pedestrian crossing and sidewalk buffering
- Advocacy groups and special interest organizations involved in health, environmental, redevelopment issues
- As a response to difficulties with access management
Context is Important

- Practical ADT operating range
- Access spacing
- Truck & bus traffic
- Need for on-street parking
- Street network configuration
- Bicycle accommodations

Practical Operating Ranges for Roadway Design Types
Choice of Roadway Section
Based on ADT and Access Spacing

ADT - Average Daily Traffic (1,000's)

Accesses / mi

Ave. Spacing
660 ft.
1/3 mi.
330 ft.

6 - Lane Divided
4 - Lane Divided
4 - Lane Undivided
3 - Lane with right turn lanes or shoulders

Basic 2-Lane
2-Lane with shoulders

7
MN MUTCD Guidance on 3-Lane Roads

- No significant guidance
- Major versus minor cross street
- Arrow spacing & placement
- Advance placement of warning signage
MN MUTCD

**GUIDANCE:**

Two-Way Left Turn Only (R3-9a or R3-9b) signs should be used in conjunction with the required pavement markings where a nonreversible lane is reserved for the exclusive use of left-turning vehicles in either direction and is not used for passing, overtaking, or through travel.

**GUIDANCE:**

Where an extra lane has been provided for slower moving traffic (see Section 2B.32), a Lane Ends (W9-2) word sign, or a Lane Ends (W4-2) symbol sign should be installed in advance of the end of the extra lane.
Recent Hennepin County Conversions to 3-Lanes

Bass Lake Road (CSAH-70)
Brooklyn Center & Crystal
Spring 2007

Douglas Drive (CSAH-102)
Crystal
Golden Valley
Summer 2010

(CSAH-101)
Minnetonka
2005-2007

Medicine Lake Road (CSAH-70)
Crystal / New Hope
Summer 2006 Extension - 2010

Lake Drive (CSAH-9)
Robbinsdale
Fall 2004

50th Street (CSAH-21)
Minneapolis
Spring 2004

Portland Ave.
(CSAH-35)
Richfield
Summer 2010
Hennepin County Practices

- County paving program – anywhere from 60 lane miles to 160 lane miles per year
- Video detection
- Restriping projects have all been “in-house”
  - Paving
  - Striping
  - Signals
50th Street – Minneapolis (Spring 2004)

ISSUES:
• Concerns about speeds
• 4-lane undivided had numerous weaving sections
• Uncomfortable as a pedestrian - traffic was adjacent to sidewalks

CHARACTERISTICS:
• 1 3/4 mile length
• Previous, existing and forecasted ADT’s stable at 12-14,000 vpd
• Four business nodes (France, Xerxes, Penn, Bryant)
• Parking important & significant bus traffic
50th Street – Minneapolis (Spring 2004)

CHARACTERISTICS:
• Short blocks
• No striping tapers
• Back to back lefts
• Major streets vs minor

ISSUES:
• On blocks with driveways on only 1 side – arrows are both the same way
• Installed arrows head-to-tail like recycling symbol instead of head to head
Lake Drive – Robbinsdale (Fall 2004)

ISSUES:
• Concerns about speeds
• Driving lanes were somewhat ambiguous – 4 or 2?
• Desire for some on-street bicycle accommodation

CHARACTERISTICS:
• 1 mile length
• Previous, existing and forecasted ADT’s stable at 8-10,000 vpd
• Couple of sharp kinks in roadway at Indiana & France Avenues
• Parking important & significant school bus traffic
Lake Drive – Robbinsdale (Near CSAH 81)

- 30 MPH
- 200’ merge
- Single sign for drivers
- Stacking for WB CSAH 9 approaching CSAH 81
Lake Drive – Robbinsdale (Near CSAH 81)
Lake Drive – Robbinsdale (Near Victory Memorial Drive)

- Final block is 120’
- Inconsistent striping of turn lanes
Medicine Lake Road – Crystal & Golden Valley (Summer 2006)

ISSUES:
• Concerns about speeds especially in area near elementary school
• Desire for some on-street bicycle accommodation

CHARACTERISTICS:
• \( \frac{1}{2} \) mile length initially – plans to extend to TH-169 (total length = 2 miles)
• Previous, existing and forecasted ADT’s stable at 8-10,000 vpd
• Excessive speeding recorded
• Nearby railroad crossing complicated transition from 4-lane
Medicine Lake Road – Crystal & Golden Valley
(Summer 2006)

• Standard signing well in advance of transition

• Consider wheel paths when lanes are offset from previous
Medicine Lake Road – Crystal & Golden Valley (Summer 2006)
Before / After Findings – CSAH-70 Speeds

### Before - EB

<table>
<thead>
<tr>
<th>Speed</th>
<th>Number</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>0 - 15</td>
<td>22</td>
<td>0.2%</td>
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<tr>
<td>15 - 20</td>
<td>140</td>
<td>1.1%</td>
</tr>
<tr>
<td>20 - 25</td>
<td>366</td>
<td>3.0%</td>
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<tr>
<td>25 - 30</td>
<td>573</td>
<td>4.4%</td>
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<td>30 - 35</td>
<td>4,013</td>
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<td>35 - 40</td>
<td>6,215</td>
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<tr>
<td>40 - 45</td>
<td>1,549</td>
<td>11.8%</td>
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<tr>
<td>45 - 50</td>
<td>163</td>
<td>1.2%</td>
</tr>
<tr>
<td>50 - 55</td>
<td>17</td>
<td>0.1%</td>
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<td>1</td>
<td>0.0%</td>
</tr>
<tr>
<td>60 - 65</td>
<td>1</td>
<td>0.0%</td>
</tr>
<tr>
<td>65 - 70</td>
<td>2</td>
<td>0.0%</td>
</tr>
<tr>
<td>70 +</td>
<td>2</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total</td>
<td>13,031</td>
<td>100.0%</td>
</tr>
<tr>
<td>85th Percentile Speed</td>
<td>39.6</td>
<td></td>
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</table>

### After - EB

<table>
<thead>
<tr>
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<tr>
<td>15 - 20</td>
<td>199</td>
<td>1.5%</td>
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<tr>
<td>20 - 25</td>
<td>820</td>
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<tr>
<td>25 - 30</td>
<td>1,204</td>
<td>8.8%</td>
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<tr>
<td>30 - 35</td>
<td>4,757</td>
<td>34.8%</td>
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<td>35 - 40</td>
<td>5,363</td>
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<td>40 - 45</td>
<td>1,761</td>
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<td>45 - 50</td>
<td>132</td>
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<tr>
<td>50 - 55</td>
<td>16</td>
<td>0.1%</td>
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<tr>
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<tr>
<td>60 - 65</td>
<td>1</td>
<td>0.0%</td>
</tr>
<tr>
<td>65 - 70</td>
<td>1</td>
<td>0.0%</td>
</tr>
<tr>
<td>70 +</td>
<td>1</td>
<td>0.0%</td>
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<tr>
<td>Total</td>
<td>13,652</td>
<td>100.00%</td>
</tr>
<tr>
<td>85th Percentile Speed</td>
<td>38.6</td>
<td></td>
</tr>
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</table>
Bass Lake Road – Brooklyn Center & Crystal (Spring 2007)

ISSUES:
• Some segments with high crash rates – run off the road crashes on curves
• Concerns about speeds
• Roadway identified on the county bike plan

CHARACTERISTICS:
• 2 mile length
• Previous, existing and forecasted ADT’s stable at 11-13,000 vpd
• Excessive speeding observed by police department
Bass Lake Road – Brooklyn Center & Crystal (Spring 2007)

- Signing is same both eastbound and westbound
- “Chimney” followed by “Merge”
Bass Lake Road – Brooklyn Center & Crystal (Spring 2007)

• At completion – transition was 4 blocks east of CSAH 81
• In 2011, CSAH 81 project reconstructed first two blocks east of CSAH 81.
  Transition was moved westward 1 block
• Despite an approved plan set that looked good to all, it didn’t work in the field.
  City and County made several field visits and came up with revised
  striping that was satisfactory for all.
### Before / After Findings - CSAH-10 Speeds

#### CSAH-10 (Bass Lake Road) Speed Distribution - Westbound
*Before / After Conversion from 4 Lane Undivided to 3 Lane type roadway*

<table>
<thead>
<tr>
<th>Speed Range (MPH)</th>
<th>Number</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
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<td>16 - 20</td>
<td>132</td>
<td>1.2</td>
</tr>
<tr>
<td>20 - 25</td>
<td>606</td>
<td>4.8</td>
</tr>
<tr>
<td>25 - 30</td>
<td>919</td>
<td>6.7</td>
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<tr>
<td>30 - 35</td>
<td>2,841</td>
<td>26.8</td>
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<tr>
<td>35 - 40</td>
<td>4,674</td>
<td>43.2</td>
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<td>40 - 45</td>
<td>1,418</td>
<td>13.4</td>
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<tr>
<td>45 - 50</td>
<td>166</td>
<td>1.6</td>
</tr>
<tr>
<td>50 - 55</td>
<td>30</td>
<td>0.1</td>
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<tr>
<td>55 - 60</td>
<td>2</td>
<td>0.0</td>
</tr>
<tr>
<td>60 - 65</td>
<td>2</td>
<td>0.0</td>
</tr>
<tr>
<td>65 - 70</td>
<td>2</td>
<td>0.0</td>
</tr>
<tr>
<td>70 +</td>
<td>6</td>
<td>0.1</td>
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<tr>
<td><strong>Total</strong></td>
<td>10,597</td>
<td>100.0</td>
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</table>

**85th Percentile Speed:** 40.5 MPH

#### CSAH-10 (Bass Lake Road) Speed Distribution - Westbound
*After Conversion*

<table>
<thead>
<tr>
<th>Speed Range (MPH)</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 15</td>
<td>66</td>
<td>0.6</td>
</tr>
<tr>
<td>16 - 20</td>
<td>160</td>
<td>1.7</td>
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<tr>
<td>20 - 25</td>
<td>469</td>
<td>4.7</td>
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<tr>
<td>25 - 30</td>
<td>873</td>
<td>8.7</td>
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<tr>
<td>30 - 35</td>
<td>3,565</td>
<td>33.9</td>
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<tr>
<td>35 - 40</td>
<td>4,162</td>
<td>41.8</td>
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<td>609</td>
<td>6.1</td>
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<tr>
<td>70 +</td>
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<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10,003</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**85th Percentile Speed:** 38.4 MPH
Douglas Drive – Crystal & Golden Valley (Summer 2010)

ISSUES:
• A few segments exhibiting higher than average crash rates
• Golden Valley concerned about walkway needs – obtained a TLC grant
• Concerns about speeds, Roadway identified on the county bike plan

CHARACTERISTICS:
• 4 mile length – longest conversion to date
• Previous, existing and forecasted ADT’s stable at 11-13,000 vpd
CSAH 101 (Minnetonka) – County CIP
Example: where a 3-Lane was not pursued
Baker Road (CSAH-60) – Eden Prairie

- No compelling issues
- Good access management
- Horizontal & vertical changes
Portland Avenue – Bloomington (Potential Future Project)

CHARACTERISTICS:
- 1/2 mile length
- ADT’s at 7,000-9,000 vpd
- Middle School pedestrian traffic
### Hennepin County - Before / After Findings – Crashes

#### Annual Average Crashes

<table>
<thead>
<tr>
<th>Location</th>
<th>Before 5-Year Annual Average</th>
<th>After Annual Average (years)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>50th Street (CSAH-21) Minneapolis</td>
<td>16.4</td>
<td>10.7 (7 yrs)</td>
<td>- 5.7</td>
</tr>
<tr>
<td>Lake Drive (CSAH-9) Robbinsdale</td>
<td>2.2</td>
<td>3.0 (7 yrs)</td>
<td>+ 0.8</td>
</tr>
<tr>
<td>CSAH-101 Minnetonka</td>
<td>5.6</td>
<td>2.0 (4 yrs)</td>
<td>- 3.6</td>
</tr>
<tr>
<td>Medicine Lake Road (CSAH-70) Crystal</td>
<td>1.2</td>
<td>0.8 (5 yrs)</td>
<td>- 0.4</td>
</tr>
<tr>
<td>Bass Lake Road (CSAH-10) Brooklyn Center &amp; Crystal</td>
<td>15.6</td>
<td>6.7 (4 yrs)</td>
<td>- 8.9</td>
</tr>
</tbody>
</table>

*Most recent crash data includes Mn\DOT 2010 CMATS data (unverified)*
City of St Paul, 4 to 3-Lanes Conversions

- Montreal - Fairview to Hamline
- Concord - Plato to 52
- Lexington - Lincoln to Jefferson
- Como - Dale to Rice
- Seventh - Jefferson to May St
- Pierce Butler - Transfer to Minnehaha
- Fairview - Marshall to Ford Pkwy
Lexington Parkway – Lincoln to Randolph
4 to 3 lane Conversion, Aug 2003

Context:

- Balance the network and roadway environment for Ayd Mill and Lexington
- Reduce traffic impacts in particular speed along Lexington, the residential corridor

Characteristics:

- .75 mile corridor
- 300 foot block spacing with mid block alleys
- Bridge with grade over RR tracks of 1000 feet
- Intersection nodes St Clair, Jefferson and Randolph
- Residential in nature side and front facing homes
- Boulevard buffer and sidewalks
- Street parking
Lexington

Lexington near Fairmount

Note: Not a 3 lane segment

Lexington south of Jefferson

Lexington near Bridge
Crash History for Segment  Lexington from Lincoln to Jefferson

Traffic Volume 18,000 ADT

Traffic Volume 13,000-15,000 ADT

Seventh Street– Jefferson to May St
4 to 3 lane Conversion, Aug 2003

Context:
- Improve Business Corridor for activities on both sides of the street
- Improve traffic movement for pedestrians as well as minor street traffic with skewed intersections

Characteristics:
- 1.5 mile corridor
- Irregular block spacing & unusual intersection geometry
  Block lengths vary from 250 – 1500 feet
- Intersection nodes Jefferson, Randolph & Otto
- State Hwy, Commercial corridor – truck and bus routes
- Sidewalk adjacent to street
- Street parking
Seventh

Seventh south of Jefferson

Seventh near James

Seventh south of Tuscarora

Seventh south of Otto
4 TO 3 LANE CONVERSION
W. 7TH - MEAN SPEEDS
Crash History for Segment

Traffic Volume

10,400 ADT

Traffic Volume

11,000 - 13,000 ADT

Notes:
Other Considerations

- A 3-lane removes ambiguity for turn maneuvers and eliminates weaving and unanticipated braking
- 3-lane overall width is similar to a 4-lane undivided
- Some drivers are initially confused by 3-lane
- The 3-lane is often viewed as a suburban solution
- If little access exists – large unused pavement
- High peak hour volumes can result in long queues
- Long queues encourage bypassing via left turn lane
- Continuous left provides flexibility for vehicle storage at major intersections (no taper)
Bike Lanes versus Shoulders

- 3-Lane conversions are often pursued in part to provide bicycle accommodations
- Accommodations can be in the form of either designated bike lanes or shoulders
- Bike lanes dedicate actual space for the bicycle – increase visibility
- Shoulders maximize flexible use of space (postal vehicles, garbage collection, etc.)
- The design through intersections is usually handled in a different manner

*Note - MN State Statutes (160.263) allows cities & counties to set speed limits (without any engineering study) where a bike lane has been established.*
Road Narrowing:
Issue of minimum dimensions for all roadway elements

Notes & Assumptions
- Bicycle zone dimensions from Mn/DOT Bike Design Manual
- Single Unit Truck dimensions from AASHTO Green Book
- Passing zone based on MN State Statute 169.18, Subd. 3
  (Statute is unclear where clearance is measured from)
- Essential maneuvering space for truck was estimated as 2 feet
  based on previous supposition and observations

Other Considerations
- The conflict zone between the maneuvering spaces of the bike
  and truck could easily have a greater overlap - the bike could be
  positioned closer to the lane of traffic, and the truck could be
  positioned closer to the bike lane.
- There will be a natural tendency for the truck to shy away from
  the roadway centerline in order to maintain a clear zone about
  equal to the estimated maneuvering space. This again could
  increase the overlap at the truck & bike maneuvering spaces.
- It is apparent that the State 3-foot passing lane would likely be
  in frequent violation if minimum roadway dimensions were used.
Other Issues

• Avoiding the design by precedence argument

• Responding to Advocates & Interest Groups

• Although we often say “its just paint”, striping changes do take considerable effort, especially time. To redo the striping is difficult since removal methods have trade-offs.

Summary

• 3-Lane roadway conversions work great – if implemented in the right context.

• Small speed reductions and modest crash reductions can be expected.

• Initial worries about confusion, side-street delays, long queues have not been found to be an actual problem.

• Motorists, bicyclists and pedestrians have generally been pleasantly surprised by how well the operations work.
Contact Information

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E-mail: monica.beeman@ci.stpaul.mn.us