Conversion of a Congested All-Way Stop Intersection to Roundabout Control

Southlake, Texas
Population ~25,000+
Neighborhood Traffic Issues

- Cut-through traffic
- Speeding on residential streets

Identify / Confirm Problems

- Data collection
  - Peak hour TMCs (Fall 2002)
  - Daily traffic volume counts (Spring 2002)
  - Origin-destination (license plate-based) data at neighborhood access points
  - Vehicular speeds
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Initial Traffic Volumes

- 16,450 entering vehicles

Cut-through Traffic

- AM only – Eastbound Continental Boulevard
- 36% of traffic exiting at Warwick Way
**Spot Speed Study**

<table>
<thead>
<tr>
<th></th>
<th>Posted Speed (mph)</th>
<th>Average Speed (mph)</th>
<th>85th Percentile Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB Byron Nelson</td>
<td>30</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>WB Byron Nelson</td>
<td>30</td>
<td>28</td>
<td>33</td>
</tr>
<tr>
<td>EB Waltham</td>
<td>30</td>
<td>27</td>
<td>31</td>
</tr>
<tr>
<td>WB Waltham</td>
<td>30</td>
<td>26</td>
<td>30</td>
</tr>
</tbody>
</table>

**Why Cut-Through?**

- Avoid AWSC Intersection
  - Max EB queue length = 41
  - Byron Nelson speed limit = 30 mph
  - Byron Nelson (2U) pavement width = 36’
  - Cut-through time savings (1:30 minutes)
Possible Cut-through Solutions

• Traffic Calming on Byron Nelson
  – Medians
  – Chokers
• Increase Capacity (add lanes) at AWSC Continental Blvd at Carroll Ave Intersection
• Change Control Type
  – Traffic signal
  – Roundabout

Possible Cut-through Solutions

Increase Capacity
10 lanes already entering intersection
Small benefit from additional right turn lanes
### Possible Cut-through Solutions

- Change Control Type
  - Traffic signal

#### AM Peak

<table>
<thead>
<tr>
<th>Intersection</th>
<th>NB</th>
<th>SB</th>
<th>EB</th>
<th>WB</th>
</tr>
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<tbody>
<tr>
<td>AM Peak</td>
<td>21.8 (C)</td>
<td>20.7 (C)</td>
<td>20.3 (C)</td>
<td>27.9 (C)</td>
</tr>
<tr>
<td>PM Peak</td>
<td>19.0 (B)</td>
<td>15.6 (B)</td>
<td>23.3 (C)</td>
<td>21.5 (C)</td>
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#### PM Peak

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<td>AM Peak</td>
<td>23.3 (C)</td>
<td>20.7 (C)</td>
<td>27.9 (C)</td>
<td>12.7 (B)</td>
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<tr>
<td>PM Peak</td>
<td>17.6 (B)</td>
<td>15.6 (B)</td>
<td>21.5 (C)</td>
<td>17.6 (B)</td>
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### Possible Cut-through Solutions

- Change Control Type
  - Roundabout

#### AM Peak

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</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>652</td>
<td>857</td>
<td>791</td>
<td>890</td>
</tr>
<tr>
<td>V/C Ratio</td>
<td>0.48</td>
<td>0.47</td>
<td>0.74</td>
<td>0.32</td>
</tr>
</tbody>
</table>

#### PM Peak

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<tbody>
<tr>
<td>Capacity</td>
<td>905</td>
<td>600</td>
<td>820</td>
<td>769</td>
</tr>
<tr>
<td>V/C Ratio</td>
<td>0.50</td>
<td>0.48</td>
<td>0.50</td>
<td>0.73</td>
</tr>
</tbody>
</table>
Deciding on a Roundabout

**Roundabout**
- Cost: $121,471
- Speed: 15-20 mph
- Safety:
  - 39% fewer crashes
  - 76% fewer injury crashes
- Delay: Shorter
- Space required: More
- Initial opposition: Can be fierce

**Traffic Signal**
- Cost: $100,000 + O&M
  - City’s first signal
- Speed: 30 mph +
- Safety: Less
- Delay: Longer
- Space required: Less
- Initial opposition: Minor

Roundabout Timeline

- 2002
  - Fall - Neighborhood study began
- 2003
  - Spring – Neighborhood study completed
- 2004
  - May - Before data collected
  - May - Construction begins after school year
  - July - Functioning as a roundabout
  - August - Roundabout complete
- 2005
  - May – After data collected
Intersection Entering Volumes

**AM PEAK HOUR**
- Increase = 74%

**PM PEAK HOUR**
- Increase = 30%

**DAILY**
- Increase = 15%

Intersection Delay

**AM Peak**
- Before: 1296 sec/veh
- After: 1686 sec/veh

**PM Peak**
- Before: 1109 sec/veh
- After: 1925 sec/veh
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Approach Delay: AM Peak

390 more vehicles entered intersection during after study

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<tbody>
<tr>
<td>Before</td>
<td>10</td>
<td>15</td>
<td>250</td>
<td>20</td>
</tr>
<tr>
<td>After</td>
<td>50</td>
<td>50</td>
<td>350</td>
<td>50</td>
</tr>
</tbody>
</table>

Approach Delay: PM Peak

816 more vehicles entered intersection during after study

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</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>20</td>
<td>20</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>After</td>
<td>100</td>
<td>100</td>
<td>120</td>
<td>100</td>
</tr>
</tbody>
</table>
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Eastbound AM Peak - Max and Average Queues

Before Volume = 979
After Volume = 1269

Westbound Queue by Minute (5:00 PM – 6:00 PM)

Before Volume = 389
After Volume = 719
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The Bottom Line

<table>
<thead>
<tr>
<th></th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
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<tbody>
<tr>
<td>Volumes</td>
<td>↑ 30%</td>
<td>↑ 74%</td>
</tr>
<tr>
<td>Intersection Delay</td>
<td>↓ 88%</td>
<td>↓ 76%</td>
</tr>
<tr>
<td>Critical Movement Queue</td>
<td>↓ 92%</td>
<td>↓ 80%</td>
</tr>
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Cut-through Complaints Eliminated!
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John Denholm: jdenholm@lee-eng.com

Roundabout Construction
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Before

After