Conversion of One-Way Couplet Streets to Two-Way

Oklahoma Traffic Engineers Association
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Overview

- Initial Considerations
- Assess the Alternatives
- Implementation Strategies
- Case Studies
Why Are One-Way Pairs Created?

- Streets grew, engineers provided solution
- Positive attributes of one-way couplets
  - Distributes traffic off congested street
  - Reduces crashes
  - Allows for better signal progression
  - Can reduce delay and emissions
  - Expands traffic exposure for development
  - Can allow room to retain/add parking on street
  - Can allow room to retain/add pedestrian space along street
Benefits of one way pairs

**INITIAL CONSIDERATIONS**

- No need for left turn bays = Room for Bulb-outs
- Closely spaced cross streets = Provide needed circulation
- Minimize travel lanes = Room for parking, sidewalks, streetscape
- Logical terminus can signify change in uses
Why Convert Back to Two-way Streets?

- Negative attributes of One-way couplets vs. Two-way
  - Can induce higher traffic speeds
  - More complex traffic circulation
  - Splits development energy, neighborhoods
- Potential economic enhancements
- End terminus configuration issues
- Development intensity/attraction imbalance on pair
- Traffic volumes or traffic patterns change
- Development patterns change
Existing One-Way Character

- One direction traffic flow
- Parking both sides
- Short Ped Crossings
Desired Two-Way Character

- Two directional flow
- Left turn bays
- Retain parking both sides
- Short Ped Crossings
Initial Steps:
1. Review the Pros and Cons Internally
   - History of installation (dates, supporters, funding, etc.)
   - Benefits/challenges of current configuration
     - Bike/ped, density, development vision, etc.
   - Identification of city internal issues and concerns
     - Maintenance, crime, crashes, etc.
Initial Steps:
2. Review the Pros and Cons with Stakeholders

- Reminder of benefits of current configuration
- Identify known shortcomings of current configuration
- Vetting of stakeholder issues, concerns, desires, vision
Initial Steps:
3. Formal Initiation of Corridor Study

- Define extent and context of study
- Stakeholder concurrence with study
- Formation of Project Steering Committee of staff and stakeholders
1. Multimodal Performance Measures
(manage expectations, data needs & analysis tools)

- Traffic Delay, Avg. Speed, Level of Service
- Net gain/loss in parking
- Traffic access and circulation complexity
- Intensity/safety of pedestrian crossings
- Streetscape (curb to ROW) space allocation
- Costs vs. Benefits
- Relative Weight of each measure
- Review Performance Measures with stakeholders
2. Operational Data Collection

- Geometrics: ROW, curb lines, sidewalks, parking, etc.
- Traffic operations (daily counts, TMCs, speeds, trucks, etc.)
- Parking operations (occupancy, turnover, etc.)
- Pedestrian and bicycle observations
- Traffic control information
- Crashes and other incidents
- Other (rail crossings, special events, etc.)
Operational Data Collection

- Geometrics: ROW, curb lines, sidewalks, parking, etc.
- Traffic operations (daily counts, TMCs, speeds, crashes, etc.)
- Other (traffic control, special events, etc.)

Table 1. Parking Maneuver Counts along Main and Gray Streets

Table 2. Available On-Street Parking Spaces along Main and Gray Streets

Table 3. Pedestrian Crossings PM Peak Hour
3. Land Use Data Collection

- **Existing**: successes and challenges
  - Development locations
  - Development performance indicators (revenue data, etc.)
- **Planned and emerging development**
- **Latent and potential development**
4. Develop Alternative Concepts

- Geometric configuration options
  - Enhanced one-way pair
  - Various two-way street concepts
- Tradeoffs between lanes and parking
- Side Street circulation options
- Terminus treatments
Alternative Concepts

Existing

Two-Way (3)

Two-Way (4)

Two-Way (5)

Modified One-Way
5. Analyze the Alternatives

- Redistribution of existing traffic, new traffic
- Initial screening of alternatives
- Comparative performance assessments
- Cost implications of top ranked alternatives
- Other implications (railroad, etc.)
REALLOCATE VOLUMES FOR TWO-WAY OPERATIONS

Critical Peak Hour Traffic Volumes
Terminus configurations effect
Crossing street turn choices
Key destination routes

ASSESS THE ALTERNATIVES
Consensus Building for Solutions

- Corridor visioning charrette with stakeholders
  - Collaboration on performance measures and weights
  - Screening of possible concepts
  - Traffic reallocation exercises (modeled vs. calculated)
  - Traffic flow simulation presentations
  - Concept visualization
Costs and Funding of Solution

- Quantify Monetary and Other Costs of Solution
- Identify Benefits of Solution (for funding justifications)
- Identify Potential Sources of Funds
  - Public (City, other agencies)
  - Private (Individual, Company, Association, Foundation, others)
- Concur on an Action Plan
  - Champion(s)
  - Partners and Responsibilities
Waco Downtown Couplets Assessment (7)

CASE STUDY #1

Deciding Issues
- Volumes
- Geometrics
- Termini
- Connections
- Driveways
- Parking
- Context
- Circulation
- Full or Part
- Cost
- Impacts
Waco Downtown Couplets Assessment

Convert 11th/12th to two-way streets

Deciding Issues

- Volumes
- Geometrics
- Termini
- Connections
- Driveways
- Parking
- Context
- Circulation
- Full or Part
- Cost
- Impacts
Waco Downtown Couplets Assessment
Convert $11^{th}/12^{th}$ to two-way streets
Waco Downtown Couplets Assessment

Convert 11th/12th to two-way streets
Waco Downtown Couplets Assessment

Keep Bosque/Homan, 17th/18th one-way

Deciding Issues

- Volumes
- Geometrics
- Termini
- Connections
- Driveways
- Parking
- Context
- Circulation
- Full or Part
- Cost
- Impacts
Waco Downtown Couplets Assessment
Convert 25th/26th to two-way streets

Deciding Issues
- Volumes
- Geometrics
- Termini
- Connections
- Driveways
- Parking
- Context
- Circulation
- Full or Part
- Cost
- Impacts

CASE STUDY #1
Waco Downtown Couplets Assessment
Convert 25th/26th to two-way streets
Downtown Norman

CASE STUDY #2
History of Main & Gray Streets

- Originally configured as two-way streets
  - 1 lane each way plus angled parking
- Converted to one-way in 1974
  - Traffic Operations Program to Increase Capacity and Safety (TOPICS)
  - University Blvd to Porter Ave the most accident prone segment in Norman.
  - Head-in parking was identified as the major cause of the collisions
- Requests to convert back to 2-way began in 1990s
  - Quick study concluded traffic would overwhelm Main Street
- Transportation Plan for 2035 showed changing traffic patterns
  - Main & Gray Streets could be reduced by one travel lane thru Downtown
Alternative Concepts

- Geometric configuration options
- Tradeoffs between lanes and parking
- Terminus treatments
Traffic Distribution onto Two-way Network
Traffic Operations Analysis

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Existing 1-way with 2015 Traffic</th>
<th>Existing 1-way with 1.2 Growth Factor</th>
<th>Two-Way Scenario 1.2 Growth Factor</th>
<th>Mitigation Scenario 1.2 Growth Factor</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Control Delay (Sec/veh)</td>
<td>LOS</td>
<td>Control Delay (Sec/veh)</td>
<td>LOS</td>
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<tr>
<td>Gray Street at Flood Avenue</td>
<td>12.6</td>
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<td>10.9</td>
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<td>4.6</td>
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<tr>
<td>Gray Street at University Boulevard</td>
<td>10.5</td>
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<td>10.2</td>
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<tr>
<td>Gray Street at Webster Avenue</td>
<td>5.5</td>
<td>A</td>
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<tr>
<td>Gray Street at Santa Fe Avenue</td>
<td>4.2</td>
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<tr>
<td>Gray Street at Crawford Avenue*</td>
<td>1.7</td>
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<td>1.4</td>
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<tr>
<td>Gray Street at Porter Avenue</td>
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<td>C</td>
<td>17.8</td>
<td>B</td>
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<tr>
<td>Main Street at Flood Avenue</td>
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<td>Main Street at Lahoma Avenue*</td>
<td>31.7</td>
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<td>63.8</td>
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<tr>
<td>Main Street at Downtown Shopping Center</td>
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<td>Main Street at University Boulevard</td>
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* Two-way stop controlled intersection. Delay based on HCM 2010 methodology

Synchro Analysis Results for Existing One-Way And Two-way Configurations (PM Peak Hour)
### Multimodal Pros and Cons of 1-1 TWLTL

<table>
<thead>
<tr>
<th>Factor</th>
<th>Positive Attributes</th>
<th>Negative Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traffic Operations</strong></td>
<td>Creates a calmer traffic environment, better suited to Downtown destination. The new directional flow on both streets provides more direct access to destinations.</td>
<td>Higher average delay, lower LOS, parking interrupts flow of the one through lane</td>
</tr>
<tr>
<td><strong>Train Crossings</strong></td>
<td>Queuing traffic still has two lanes in each direction spread across two streets; queues generally dissipate after one traffic signal cycle</td>
<td>Traffic queues are about 1.5 to 2 times as long as existing, back of queue extends to over 3 blocks on Main Street during PM peak</td>
</tr>
<tr>
<td><strong>Pedestrian Crossings</strong></td>
<td>The bulb-outs are retained, keeping crossing distances minimal with good pedestrian visibility and accommodations</td>
<td>Pedestrians must watch for added conflicts from left and right turning vehicles from added traffic direction</td>
</tr>
<tr>
<td><strong>Parking</strong></td>
<td>Retains angled parking on both sides, center turn lane allows use of angled parking from both directions by smaller vehicles (special ordinance)</td>
<td>Added cost to re-orient parking stalls and modify bulb-outs, large vehicles would need to turn from through lane to enter opposite side parking</td>
</tr>
<tr>
<td><strong>Special Events</strong></td>
<td>Downtown functional as a destination with same amount of angled parking and new parking garage, traffic flow more logical for visitors</td>
<td>High traffic generation events will not be as well accommodated for throughput.</td>
</tr>
<tr>
<td><strong>Development</strong></td>
<td>The two-way flow of traffic on both streets and the traffic calming allow for better visibility of businesses, less focus on passing through Downtown</td>
<td>Current pass-thru traffic may divert to other routes, reducing exposure</td>
</tr>
</tbody>
</table>
Steps to Converting Main and Gray Streets from 1-way to 2-way

1. Oversized base on pedestals for future opposite flow signal pole
Steps to Converting Main and Gray Streets from 1-way to 2-way

1. Convert one lane to opposite flow on lower volume street
Steps to Converting Main and Gray Streets from 1-way to 2-way

3. Convert one lane to Eastbound on Westbound Gray Street only
   A. Erect EB signal poles & test lights, install RR xing arms, bag new signs, then
   B. Stripe the lane line, connect signal heads, unbag signs, open EB
Steps to Converting Main and Gray Streets from 1-way to 2-way

4. Convert one lane to Westbound on Eastbound Main Street only
   A. Erect WB signal poles & test lights, install RR xing arms, bag new signs, then
   B. Re-stripe angled parking on north side of Main Street to reverse the angle, then
   C. Stripe the lane line, connect signal heads, unbag signs, open WB lane
Steps to Converting Main and Gray Streets from 1-way to 2-way

5. Convert center lane on Main and Gray Streets to TWLTL w/ LT bays

A. Stripe the lane line, adjust signal indications as needed.
## Costs of Converting Main and Gray Streets from 1-way to 2-way

<table>
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<th>Improvement</th>
<th>Estimated Costs</th>
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<tr>
<td>Traffic Signal Modifications (opposite flow signal at 7 intersections)</td>
<td>$200,000</td>
</tr>
<tr>
<td>Traffic Signal Operation Modifications at Terminus Intersections</td>
<td>$100,000</td>
</tr>
<tr>
<td>New traffic signals (4 intersections @ $250K ea.)</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Intersection modification for improved LOS for key cross streets</td>
<td>$200,000</td>
</tr>
<tr>
<td>Pavement Markings and opposing direction signage</td>
<td>$200,000</td>
</tr>
<tr>
<td>Railroad Crossing Improvements (opposite flow Signals and Gates)</td>
<td>$300,000</td>
</tr>
<tr>
<td>Supplemental Safety Devices for Railroad Quiet Zone</td>
<td>$1,000,000</td>
</tr>
<tr>
<td><strong>Total Potential Cost</strong></td>
<td><strong>$3.0 Million</strong></td>
</tr>
</tbody>
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Discussion

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