Planning for Economic Cycles - Permian Basin Case Study

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Bottom Line

• The Permian Basin is facing challenges in roadway safety, pavement condition, traffic demand. Challenges are here to stay.
• Safety and reliability are closely linked; access management is a key to improvement in both areas
• Need to know what is coming and look for opportunities to get ahead
• Must be nimble and shift from standard approaches
• Recognize need for change – reach out to key players and make changes now
Odessa District

The Challenges

• Safety
• Pavement Conditions
• Traffic Demands

General Observations

• Safety and reliability are directly related
• TxDOT can affect safety by addressing reliability
Safety, Reliability and Risk Management
Long-Term Issue – Oil

Total Permian Basin Oil Production
Millions of barrels per day

Source: US Energy Information Administration, Drilling Productivity Report
Long-Term Issue – Oil

WTI Price vs. Permian Daily Crude Production Rate

Production (MMbbl/day), 4.34

Price ($/bbl), $54.81
Projected Daily Oil Production in the Permian Basin
Results by varying oil price assumptions, millions of barrels per day

Source: US Multi-Regional Econometric Model, The Perryman Group
Drilled Uncompleted Wells

Short-Term Issue
Loving County, Charlie Robison
“The frost on the windshield shines toward the sky
Like a thousand tiny diamonds
In the lights of Loving County.”
US 285 Crashes – Heat Map
US 285 Crashes – Significant Trends (K + A)
Traffic Data Findings

• Key Elements
  • Traffic Counts
  • Vehicle Classification
  • Vehicle Weight

• Data Trends
  • ADTs in excess of 10K
  • 30% - 40% Trucks (more like an IH)
  • 15% - 25% of trucks overweight
  • 20 year ESALs – range from 20M – 30M+
    on major routes
Hourly Vehicle Distribution

Northbound US285 (North of SH302)

Urban Characteristics (Timing Opportunity?)

Southbound US285 (North of SH302)
## Well Completion Truck Generation

<table>
<thead>
<tr>
<th>Well Development Process</th>
<th>Number of trucks Pre-2016 Trucking Water</th>
<th>Number of Trucks Post-2016 Trucking Water</th>
<th>Number of Trucks Post-2016 Water Wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracking Equipment</td>
<td>74</td>
<td>74</td>
<td>74</td>
</tr>
<tr>
<td>Fracking Water</td>
<td>527</td>
<td>3000</td>
<td>0</td>
</tr>
<tr>
<td>Fracking Sand</td>
<td>66</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Other Additives/Fluids</td>
<td>11</td>
<td>66</td>
<td>66</td>
</tr>
<tr>
<td>Flowback Water Removal</td>
<td>132</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>810</strong></td>
<td><strong>4490</strong></td>
<td><strong>1490</strong></td>
</tr>
</tbody>
</table>
What Did the Data Tell Us?

- Crashes occur throughout the corridor.
- Pavement design ESAL assumptions must be increased.
- Access Management is the top issue – Too many access points, poor driveways, need for more turn lanes, and better wayfinding.
- Intersection improvements – great potential to reduce delays.
- Opportunities exist for reduction in demand (fresh water/timing).
- Overweight trucks have a huge impact on pavement condition – which is then followed by construction activity.
- Roadway demand is not going away soon – Sustain focus (public and industry) through ebb and flow of energy economics.
Access Management
Findings/Recommendations

1. Existing TxDOT Policy provides great flexibility
2. Improve access points – Implement the hybrid driveway design that accommodates the range of larger vehicles (WB-67).
3. Improve spacing/interaction of access points – current practice supports spacing of one mile.
4. Pursue combining driveways.
5. Provide provisions for turning movements (TWLTL/Left Turn Lanes, Right Turn Lanes/Full Width Shoulders)
6. Add Mile Markers/Standardized Site Signing to aid in navigation
## Crash Reduction Potential

<table>
<thead>
<tr>
<th>Feature</th>
<th>Crash Reduction Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Left-Turn Lane</strong></td>
<td>48% crash reduction for installing turn lanes on both approaches of the major road (4-leg intersection)</td>
</tr>
<tr>
<td><strong>Right Turn Lane</strong></td>
<td>31% decrease in rear-end crashes for installing right-turn lane</td>
</tr>
<tr>
<td><strong>Roundabout</strong></td>
<td>71% reduction for installing a single-lane roundabout in a rural setting with an 87% reduction in injury crashes.</td>
</tr>
<tr>
<td><strong>Two-Way Left-Turn Lane</strong></td>
<td>34% to 36% reduction for installing a TWLTL</td>
</tr>
<tr>
<td><strong>Super 2</strong></td>
<td>35% reduction for converting a two lane rural road to a Super 2 configuration</td>
</tr>
</tbody>
</table>
Permian Basin Energy Sector Activity Heat Map
Programmed Projects
Using TTI Findings: Changes Made During Project Delivery

- Found potential weaknesses within current projects
- Add turn lanes – $2 million
- Add passing lanes – $6 million
- Increasing pavement strength – $26 million
Using TTI Findings: In-Progress Implementation

- Trial implementation of improved signage
- Alter future pavement designs
- Proactively seek locations for access management improvements
Using TTI Findings: Making Proactive Changes

• Locate hot zones
• Monitor key roads
• Determine available early options from TTI recommendations
• Prioritize improvements
Tracking Deterioration: ODA Field Tool
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