## Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Facilitator</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00-8:30</td>
<td>Registration</td>
<td></td>
</tr>
<tr>
<td>8:30-8:45</td>
<td>Welcome</td>
<td>Jon Epps – TTI</td>
</tr>
<tr>
<td>8:45-9:00</td>
<td>History of Accelerated Construction in U.S.</td>
<td>David Newcomb – TTI</td>
</tr>
<tr>
<td>9:00-9:30</td>
<td>TxDOT’s Interest</td>
<td>Randy Hopmann – TxDOT, ADM</td>
</tr>
<tr>
<td>9:30-9:50</td>
<td>Project Selection Based on Economics</td>
<td>David Ellis – TTI</td>
</tr>
<tr>
<td>9:50-10:10</td>
<td>Break</td>
<td></td>
</tr>
<tr>
<td>10:10-10:40</td>
<td>Project Development</td>
<td>Tracy Cain – TxDOT, CST</td>
</tr>
<tr>
<td>10:40-11:00</td>
<td>Accelerated Bridge Construction in Texas</td>
<td>Graham Bettis – TxDOT, BRG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prapti Sharma – TxDOT, FTW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ray Fisher – TxDOT, DAL</td>
</tr>
<tr>
<td>11:00-11:20</td>
<td>Design Considerations with Examples of Past Success</td>
<td>Lacey Rodgers – TxDOT, DAL</td>
</tr>
<tr>
<td>11:20-11:30</td>
<td>Traffic and Safety</td>
<td>Ceason Clemens – TxDOT, DAL</td>
</tr>
<tr>
<td>11:30-11:40</td>
<td>Public Information</td>
<td>Tony Hartzel – TxDOT, DAL</td>
</tr>
<tr>
<td>11:40-12:00</td>
<td>Accelerated Construction Concepts</td>
<td>Phillippe Falkner – Ed Bell Construction Company</td>
</tr>
<tr>
<td>12:00-12:45</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>12:45-1:00</td>
<td>Charge to Breakout Groups</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A-Pavement Strengthening</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B-Pavement Widening</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C-Rural Intersection Reconstruction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D-Widening Bridge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E-Small Town Intersection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F-Suburban/Rural Widening</td>
<td></td>
</tr>
<tr>
<td>1:00-2:30</td>
<td>Facilitated Discussion</td>
<td>Group Leaders – TxDOT</td>
</tr>
<tr>
<td>2:30-3:15</td>
<td>Report from Breakout Groups &amp; Discussion</td>
<td>David Newcomb – TTI</td>
</tr>
<tr>
<td>3:15-3:30</td>
<td>Break</td>
<td></td>
</tr>
<tr>
<td>3:30-3:45</td>
<td>Looking to the Future – Contractor</td>
<td>Phillippe Falkner – Ed Bell Construction Company</td>
</tr>
<tr>
<td>3:45-4:15</td>
<td>Looking to the Future – TxDOT</td>
<td>Randy Hopmann – TxDOT, ADM</td>
</tr>
<tr>
<td>4:15-4:30</td>
<td>Summary and Adjourn</td>
<td>Jon Epps – TTI</td>
</tr>
</tbody>
</table>
District Workshops on Accelerated Construction
Welcome
AC-PP-17-01
Jon Epps

Dallas/Fort Worth/Waco
Westin DFW
June 13, 2017
Accelerated Construction

• Welcome
• Definition
• Overview of day
• Overview of topics
• Overview of goals
• Introductions
### Project Delivery

<table>
<thead>
<tr>
<th>Planning &amp; Programming</th>
<th>Preliminary Design</th>
<th>Environmental</th>
<th>ROW Utilities</th>
<th>PS&amp;E</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Need</td>
<td>• Design Concept</td>
<td>• Preliminary</td>
<td>• Data Collection</td>
<td>• Design details</td>
</tr>
<tr>
<td>• Scope</td>
<td>• Data Collection</td>
<td>• Interagency</td>
<td>• ROW map</td>
<td>• Final alignment &amp; profiles</td>
</tr>
<tr>
<td>• Cost estimate</td>
<td>• Public meetings</td>
<td>• Documentation</td>
<td>• Appraisals</td>
<td>• Roadway</td>
</tr>
<tr>
<td>• Authorization</td>
<td>• Schematics</td>
<td>• Public hearing</td>
<td>• Acquisition</td>
<td>• Operational</td>
</tr>
<tr>
<td>• Planning</td>
<td>• Preliminary</td>
<td>• Clearances</td>
<td>• Utility adjustment</td>
<td>• Bridge</td>
</tr>
<tr>
<td>• Funding</td>
<td>• Geometric</td>
<td></td>
<td></td>
<td>• Drainage</td>
</tr>
<tr>
<td></td>
<td>• Value Engineering</td>
<td></td>
<td></td>
<td>• Misc structures</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Traffic control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Review</td>
</tr>
</tbody>
</table>

Time

Letting

Construction

**Texas A&M Transportation Institute**
Definition of Construction

Greenfield

• Capacity improvement
• Reconstruction
• Rehabilitation
• Major maintenance
• Minor maintenance
Acceleration Goals

NOT

reduction in time to complete project

WANT
Not All Projects Are Suitable for Accelerated Construction
Workshop Goals

• Information sharing
• Existing TxDOT “tools”
• Identify needed “tools” & “policies”
<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Facilitator</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30-8:45</td>
<td>Welcome</td>
<td>Epps</td>
</tr>
<tr>
<td>8:45-9:00</td>
<td>History of Accelerated Construction</td>
<td>Newcomb</td>
</tr>
<tr>
<td>9:00-9:30</td>
<td>TxDOT’s Interest</td>
<td>Hopmann/Cain</td>
</tr>
<tr>
<td>9:30-9:50</td>
<td>Project Selection Economics</td>
<td>Glover/Ellis/Newcomb/Epps</td>
</tr>
<tr>
<td>9:50-10:10</td>
<td>BREAK</td>
<td>TBD</td>
</tr>
<tr>
<td>10:10-10:40</td>
<td>Project Development</td>
<td>Cain</td>
</tr>
<tr>
<td>10:40-11:00</td>
<td>Accelerated Bridge Construction</td>
<td>Division/District</td>
</tr>
<tr>
<td>11:00-11:20</td>
<td>Design Considerations</td>
<td>Local Dist. Rep.</td>
</tr>
<tr>
<td>11:30-11:40</td>
<td>Public Information</td>
<td>Local Dist. Rep.</td>
</tr>
<tr>
<td>11:40-12:00</td>
<td>Construction</td>
<td>Local Contractor</td>
</tr>
<tr>
<td>12:00-12:45</td>
<td>LUNCH</td>
<td></td>
</tr>
</tbody>
</table>
## Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Facilitator</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:45-1:00</td>
<td>Charge to Groups</td>
<td>Newcomb</td>
</tr>
<tr>
<td>1:00-2:30</td>
<td>Group Discussion of Example Problems</td>
<td>Group Leaders/Recorders</td>
</tr>
<tr>
<td>2:30-3:15</td>
<td>Reports from Groups</td>
<td>Group Recorders</td>
</tr>
<tr>
<td>3:15-3:30</td>
<td>BREAK</td>
<td></td>
</tr>
<tr>
<td>3:30-3:45</td>
<td>Contractor’s View of the Future</td>
<td>TBD</td>
</tr>
<tr>
<td>3:45-4:15</td>
<td>TxDOT’s View of the Future</td>
<td>Hopmann/Cain</td>
</tr>
<tr>
<td>4:15-4:30</td>
<td>Summary/Adjourn</td>
<td>Epps</td>
</tr>
</tbody>
</table>
• Briefs
• Implementation Reports
• Presentations
Accelerated Construction

TxDOT  Industry
Accelerated Construction

- Construction Methods
- Traffic Management
- Work Zone Safety
- Equipment
- Materials
- Economics
Introductions
Accelerated Construction

U.S. History
History

• 1988 – GET-IN STAY –IN: GET-OUT STAY-OUT (NV)
• 1998 – GET-IN STAY –IN: STAY-OUT (CA)
• 1999 – TRB Task Force
• 2000 – Workshop to Define State-of-Practice (DC)
• 2002 – Accelerate Construction Technology Transfer (ACTT)
• 2002 – Workshops for Specific Project (IN) (PA)
• 2003 – Project Pegasus (TX) (IH 30 & IH 35E)
# 1990’s – 2000’s Driving Forces

## Increasing Demand (1980-2000)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles Miles</td>
<td>+80 %</td>
</tr>
<tr>
<td>Drivers</td>
<td>+31 %</td>
</tr>
<tr>
<td>Lane Miles</td>
<td>+ 3.8%</td>
</tr>
</tbody>
</table>

## Aging System

- 40 % Bridges +40 Years Old
- Pavements Exceeded Design Life
### Accelerated Construction Skill Sets

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing</td>
<td>Utilities</td>
</tr>
<tr>
<td>Contracting</td>
<td>ROW</td>
</tr>
<tr>
<td>Work Zone</td>
<td>Railroad</td>
</tr>
<tr>
<td>Mobility</td>
<td>Communication/Outreach</td>
</tr>
<tr>
<td>Corridor Improvement</td>
<td>Training</td>
</tr>
<tr>
<td>Worker Health &amp; Safety</td>
<td>Long Life Bridges</td>
</tr>
<tr>
<td></td>
<td>Long Life Pavements</td>
</tr>
<tr>
<td></td>
<td>Quality Control</td>
</tr>
<tr>
<td></td>
<td>Modular/Prefab Construction</td>
</tr>
<tr>
<td></td>
<td>Constructability</td>
</tr>
</tbody>
</table>

*Texas A&M Transportation Institute*
Recurring Peak-Period Congestion

- Uncongested
- Congested
- Highly Congested

Peak-Period Congestion on NHS

2011

2040
Peak-Period Congestion on NHS

Recurring Peak-Period Congestion

- Uncongested
- Congested
- Highly Congested

2011

2040
Project Costs by Type, Related to Duration

- Total Cost
- Construction Cost
- Road User Cost
- Contract Administration Cost

Graph showing the relationship between cost and duration for various project costs.
AR and LA - Rubblization Projects

• 300 Miles of Interstate Concrete Pavement (Decker and Hansen, 2005)
  • Rehabilitation needed
  • Slowest construction operation – demolition and removal
  • Rubblization kept in-place PCC to serve as high-quality base
  • Rate of production for rubblization = 1 lane-mile/day
    (twice the rate for PCC removal (Mn/DOT, 2005)

• Louisiana (Landers, 2011)
  • Used for I-55 (hurricane evac route)
  • Completed in seven months as opposed to 2-3 years for reconstruction

- 33 lane-miles of asphalt paving
- AADT = 180,000 vpd (7% Commercial)
- Project dates: Aug 2 – 12
- One 100-hour window
  - 5.5 miles of 6-lane road
  - 40,000 tons asphalt mix
- Total duration of project reduced 85%
- If night closures used, 32 nights required
- Project savings only about 2 percent
- ODOT reported improved safety for public and workers
Wilmington, DE – I-95, 2000 (FHWA, 2003)

- $23.5 million - 2 years
- 24.4 lane-miles, 10 interchanges, bridge repairs, drainage improvements, lighting/safety
- AADT = 100,000 vpd (11% Commercial)
- Full road closure (reroute to I-495)
- Rubblilzation with asphalt overlay
- SB and NB I-95 closed 3 months each
- $25,000/day bonus for early completion, penalty for delay
- 75% reduction in duration (185 days)
- Detour - overall project costs increased
Maine – I-295, 2008 (Lane, 2009)

- 1970’s JRCP in S. Maine had ASR
- Important tourist route
- Remove top 3” JRCP, rubblize rest
- Full road closure, mid June – end of Aug
- Conventional lane closures = 3 construction seasons
- Traffic detoured on local roads – some improvements
- Incentive/disincentive up to $2 million
- Work completed 20 days ahead of schedule
- Contractor used up to 5 paving crews at once on project
Georgia I-85, (Anderson et al., 2006)

- Slab saw cuts at night 9 pm – 5 am
- Excavation & paving on weekends
- Preplanned equipment staging
- On-site batch plant
- Nearby disposal sites
- Quick-change moveable barrier
- Extensive public info
- Hour-by-hour monitoring of project and weather
California I-15, (Anderson et al., 2005)

- Rebuild I-15
- Used 96-hr closures
- Compressed work from 8.5 months to 6 weeks
- Had contingencies for brush fires, weather, congestion, material shortage, etc.
- Selective use of rapid-curing cement
- Contractor flexibility – key to success
Austin Lamar Blvd. (Anderson et al. 2005)

• Complex project involving utilities
• Prequalified bidders
• Req’d 12-hr days, 7 d/wk (14 on/2off)
• 3 milestones with up to $120k bonus for each
• Penalty - $20k/day
• Urban area – intersections on weekend, noise mitigation at night
• PR campaign was successful
Summary

• Accelerated construction not new

• Requires
  • Right application
  • Incentives/disincentives
  • Recognition of and planning for risks
  • Flexibility on part of agency and contractor
  • Innovative thinking
  • Public engagement

• Will become more standard with time
Things Will Not Become Simpler!

(a) Year 2011

(b) Year 2040
Outline

• Background
• Texas Landscape
• Texas History
• Opportunities
• Workshop Outcomes
## Project Delivery

<table>
<thead>
<tr>
<th>Planning &amp; Programming</th>
<th>Preliminary Design</th>
<th>Environmental</th>
<th>ROW Utilities</th>
<th>PS&amp;E</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Need</td>
<td>Design Concept</td>
<td>• Preliminary</td>
<td>• Data Collection</td>
<td>• Design details</td>
</tr>
<tr>
<td>• Scope</td>
<td>• Data Collection</td>
<td>• Interagency</td>
<td>• ROW map</td>
<td>• Final alignment &amp; profiles</td>
</tr>
<tr>
<td>• Cost estimate</td>
<td>• Public meetings</td>
<td>• Documentation</td>
<td>• Appraisals</td>
<td>• Roadway</td>
</tr>
<tr>
<td>• Authorization</td>
<td>• Schematics</td>
<td>• Public hearing</td>
<td>• Acquisition</td>
<td>• Operational</td>
</tr>
<tr>
<td>• Planning</td>
<td>• Preliminary</td>
<td>• Clearances</td>
<td>• Utility adjustment</td>
<td>• Bridge</td>
</tr>
<tr>
<td>• Funding</td>
<td>• Geometric</td>
<td></td>
<td></td>
<td>• Drainage</td>
</tr>
<tr>
<td></td>
<td>• Value Engineering</td>
<td></td>
<td></td>
<td>• Misc structures</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Traffic control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Review</td>
</tr>
</tbody>
</table>

**Time**

- **Letting**
- **Construction**

[Source: Texas A&M Transportation Institute]
## Economic Considerations - Examples

<table>
<thead>
<tr>
<th>Project</th>
<th>Per Month Costs</th>
<th>Project Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widen FM road from 2-lanes to 4-lanes (2.7 miles)</td>
<td>$96,000</td>
<td>$3.5M</td>
</tr>
<tr>
<td>Widen Freeway (2.6 miles)</td>
<td>$297,000</td>
<td>$17.8M</td>
</tr>
<tr>
<td>Interchange in urban area (1.5 miles)</td>
<td>$447,000</td>
<td>$5.1M</td>
</tr>
</tbody>
</table>
Interest in Construction

• Visibility to public
• Safety
• Economics
Acceleration Goals

NOT

reduction in time to complete project

WANT
Economic Considerations - Stakeholders

- Agency
  - Extra engineering costs
  - Extra management
  - Price escalation

- Public
  - Time
  - Fuel
  - Vehicle Damage

- Contractor
  - Unproductive labor/equipment
  - Material inventory
  - Insurance/bonding capacity
Economic Consideration

• Direct project costs
  ▪ Agency
  ▪ Some contractor

• Indirect project costs (user/non-user)
  ▪ User fuel/time
  ▪ Roadside businesses
  ▪ Business efficiency (timely delivery)
  ▪ Some Contractor

All costs eventually borne by the public
Concept

• Reduce days/month
• Reduce time by 20 - 50 percent
• Examples
  ▪ HMA overlay (30 days to 6 days)
  ▪ Rehabilitation (9 months to 4 weekends)
  ▪ Add lanes (18 months to 9 months)
  ▪ Reconstruction (3.5 years to 1.8 years)
Safety & Economics

• Reduce time traffic in work zone
• Traffic not in work zone
• Reduce user delay costs
  ▪ Fuel
  ▪ Time
• Vehicle maintenance
• User cost savings exceed construction costs
Reduce Construction Time

• Contracting methods
  ▪ Design/Bid/Build
  ▪ Cost-Plus Time (A+B)
  ▪ Interim completion dates
  ▪ No-excuses incentives
  ▪ Construction manager at risk
  ▪ Design/Build

• Lane occupancy time
  ▪ Off peak traffic
    • Day
    • Night
  ▪ Long weekend closures
  ▪ Close facility
Reduce Construction Time

- Bridges/Culverts (ABC)
- Pavements
Not for every project
Outline

• Background
• **Texas Landscape**
• Texas History
• Opportunities
• Workshop Outcomes
Recurring Peak-Period Congestion

- Uncongested
- Congested
- Highly Congested

Peak-Period Congestion on NHS

2011

2040
2017 Unified Transportation Program (UTP)

2017–2026
Transportation Planning & Programming
We Build Texas

Field Guide to
Successful Project Delivery

We build Texas – Safely
We build Texas – Quality
We build Texas – On Time
We build Texas – Together

Working together to successfully deliver projects.

Texas Department of Transportation

Associated General Contractors of Texas
Workforce
Outline

• Background
• Texas Landscape
• **Texas History**
• Opportunities
• Workshop Outcomes
• 1998 – Heald
  ▪ Legislators – TxDOT & User Costs for Liquidated Damage
  ▪ Commission – Reduce Construction Time
  ▪ Incentives/disincentives

• 2001 – Johnson’s “Transportation Working Group”
  ▪ Reduce project delivery time by 15% by 2006
  ▪ Address cost of disruption of traffic

• 2002 – Saenz
  ▪ Accelerated construction – Businesses & traffic flow impacted
  ▪ Calendar day definition of working day
  ▪ Milestones for incentives/disincentives
  ▪ Lane rental
  ▪ A+B
• 2003 – “Accelerated Construction Strategies Guidelines”

• 2004 – Saenz
  ▪ Use accelerated construction on
    • High traffic locations
    • Significant impact on safety or businesses
    • Other project specific reasons

• 2009 – Bohuslav – AASHTO Scan Tour
Katy Freeway (IH-10)

- Traditional construction – 12 years
- Accelerated construction – 6 years
Katy Freeway (IH-10)

- 23 miles
- 280,000 VPD
- $2.6 billion (2/3 construction)
- 6 years vs 12 years
Estimated Value of Fuel Wasted and Time Delays on the Katy Freeway Project
Katy Freeway Economics

- $150 - $200 million/year
- Accelerated construction benefit - $2.8 billion
- Cost of accelerated construction - $309 million
- B/C ratio – 9.0
Outline

• Background
• Texas Landscape
• Texas History

• Opportunities
• Workshop Outcomes
Barriers/Opportunities

- Materials
- Equipment
- QC/QA
- Traffic control
- Workforce
- Economic incentives
- Safety
Materials

- Strength gain (time, temp)
- Removal
- Production
- Transportation
- Placement
Equipment

- Materials handling
- Demand for equipment
- Prototype/production unit/redesign
- Cost
Process Control/Quality Control

- High production/placement rates
- Rapid tests
- Quick feedback to produce quality
- Management to insure quality
Traffic Control

• Place/remove quickly
• Moving construction zone
• Protect driver/contractor workforce
Workforce

• Skill set
  ▪ New equipment
  ▪ New materials
  ▪ QC/QA

• Congested work zone

• Shift length

• Housing/facilities
• Personal life
• Management team
• Financial
Economic Incentives - Contractor

• One job/occasional job
• Return on investment (equipment)
• Bonding capacity
• Backlog of work
• Risk
Key Items

• Project selection & planning
• Contracting methods
• Design
• Contractor selection
• Construction considerations
Emergency Accelerated Construction

- Weather events
- Catastrophic traffic impacts (bridges)
Emergency Accelerated Construction

Contractor Selection

• Resources (equipment & workforce)
• Mobilization
• Financial capacity
• Relationships with material suppliers/fabricators
• Ability to communicate – suppliers/fabricators, public, contractor personnel
Emergency Accelerated Construction

Design

• Conservative
• Flexible
• Materials availability/logistics
Emergency Accelerated Construction

Other

• Technical experts on job
• Project level decisions
Planned Accelerated Construction

• TxDOT champion
• TxDOT/FHWA support team available
• Vision – goals & objectives
• Policies & procedures
• Partnering
• Alternative contracting methods
• Cultural change
Planned Accelerated Construction (Cont’d)

- New technologies
- Total costs – Agency, construction, user, non-user, safety environmental
- Engage construction & materials industries
- Performance measures
- Learn from past & improve
Keys to Accelerated Construction

- Consider accelerated construction in planning stage
- Isolate construction work from traffic
- Reuse existing materials on site
- Maintain lane closure as long as possible
- Contractor control of workforce
- Innovative approaches to traffic handling
Outline

• Background
• Texas Landscape
• Texas History
• Opportunities

• Workshop Outcomes
Workshop Goals

• Information sharing

• Existing TxDOT “tools”

• Identify needed “tools” & “policies”
Not All Projects Are Suitable for Accelerated Construction
District Workshops on Accelerated Construction
Economic Screening Tools
AC-PP-17-04
David Ellis

Dallas/Fort Worth/Waco
Westin DFW
June 13, 2017
Economic Screening Tools

- TxDOT- 2003 Guides
- Preliminary Economic Screening Tool
- Project Level Economic Screening Tool
- CA4PRS
Project Level Economic Screening Tool

- Benefit-Cost tool

- Focus – road user costs and economic losses

Economic Impact
Project Level Economic Screening Tool

Inputs

• Traffic Data
• Geographic Location
• Cost to Accelerate Construction

• Project Timing
• Construction Segments
• Adjacent Retail Businesses
Project Level Economic Screening Tool

- **Urban** • Major metropolitan and urban areas
- **Suburban** • Areas adjacent to major metropolitan and urban areas
- **Rural** • Areas outside of urban and suburban areas
### Project Level Economic Screening Tool

#### Preconstruction Conditions

<table>
<thead>
<tr>
<th>Project Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Operating Speed</td>
<td>55</td>
</tr>
<tr>
<td>Segment Length (miles)</td>
<td>6.0</td>
</tr>
<tr>
<td>Pre Construction ADT</td>
<td>47,000</td>
</tr>
<tr>
<td>Percent Trucks</td>
<td>10%</td>
</tr>
<tr>
<td>Project Region</td>
<td>Suburban</td>
</tr>
<tr>
<td>Retail (SQFT)</td>
<td>48,000</td>
</tr>
<tr>
<td>Travel Time per Trip (minutes)</td>
<td>6.5</td>
</tr>
</tbody>
</table>

**NOTE:** There can be significant variation in economic impact due to the type of business as well as type of area (urban, suburban and rural). For the purposes of this model retail sales per square foot was used as the default method of calculation. Further, while the model has three different area types from which to chose, even within those area types, there can be significant variation in sales per square foot depending on the specific location. In terms of economic impact, this model provides general guidance only.

#### Traditional Construction Parameters

<table>
<thead>
<tr>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>900</td>
</tr>
<tr>
<td>75%</td>
</tr>
</tbody>
</table>

#### Accelerated Construction Parameters

<table>
<thead>
<tr>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$3,000,000</td>
</tr>
<tr>
<td>365</td>
</tr>
<tr>
<td>75%</td>
</tr>
</tbody>
</table>

#### Traditional Construction Scenario

<table>
<thead>
<tr>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$69,823,841</td>
</tr>
<tr>
<td>$13,542,768</td>
</tr>
<tr>
<td>$83,366,609</td>
</tr>
<tr>
<td>$20,890,047</td>
</tr>
<tr>
<td>$10,410,415</td>
</tr>
<tr>
<td>$31,300,462</td>
</tr>
</tbody>
</table>

#### Accelerated Construction Scenario

<table>
<thead>
<tr>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$28,317,447</td>
</tr>
<tr>
<td>$5,492,345</td>
</tr>
<tr>
<td>$33,809,791</td>
</tr>
<tr>
<td>$8,472,075</td>
</tr>
<tr>
<td>$4,222,001</td>
</tr>
<tr>
<td>$12,694,076</td>
</tr>
<tr>
<td>Project Parameters</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>Average Operating Speed</td>
</tr>
<tr>
<td>Segment Length (miles)</td>
</tr>
<tr>
<td>Pre Construction ADT</td>
</tr>
<tr>
<td>Percent Trucks</td>
</tr>
<tr>
<td>Project Region</td>
</tr>
<tr>
<td>Retail (SQFT)</td>
</tr>
<tr>
<td>Travel Time per Trip (minutes)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Traditional Construction Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Project Period (calendar days)</td>
<td>900</td>
</tr>
<tr>
<td>Percent of ADT that is Traveling During Peak Periods</td>
<td>75%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Traditional Construction Scenario</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile Travel Time Value</td>
<td>$69,823,841</td>
</tr>
<tr>
<td>Truck Travel Time Value</td>
<td>$13,542,768</td>
</tr>
<tr>
<td><strong>Total Travel Time Value</strong></td>
<td><strong>$83,366,609</strong></td>
</tr>
<tr>
<td>Automobile Operating Cost</td>
<td>$20,890,047</td>
</tr>
<tr>
<td>Truck Operating Cost</td>
<td>$10,410,415</td>
</tr>
<tr>
<td><strong>Total Operating Cost</strong></td>
<td><strong>$31,300,462</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accelerated Construction Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Added Cost of Accelerate Construction</td>
<td></td>
</tr>
<tr>
<td>Added Cost of Incentives</td>
<td></td>
</tr>
<tr>
<td>Total Project Period (calendar days)</td>
<td></td>
</tr>
<tr>
<td>Percent of ADT that is Traveling During Peak Periods</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: There can be significant variation in these parameters depending on the specific type of business as well as the default method of calculation. For the purposes of this model, the model provides general guidance.
Preconstruction Conditions

NOTE: There can be significant variation in economic impact due to the type of business as well as type of area (urban, suburban and rural). For the purposes of this model retail sales per square foot was used as the default method of calculation. Further, while the model has three different area types from which to choose, even within those area types, there can be significant variation in sales per square foot depending on the specific location. In terms of economic impact, this model provides general guidance only.

<table>
<thead>
<tr>
<th>Values</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>47,000</td>
</tr>
<tr>
<td></td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Suburban</td>
</tr>
<tr>
<td></td>
<td>48,000</td>
</tr>
<tr>
<td></td>
<td>6.5</td>
</tr>
</tbody>
</table>

| Added Cost of Accelerate Construction | $3,000,000 |
| Added Cost of Incentives | |
| Total Project Period (calendar days) | 365 |
| Percent of ADT that is Traveling During Peak Periods | 75% |

| Values | $69,823,841 |
|        | $13,542,768 |
|        | $83,366,609 |
|        | $20,890,047 |
|        | $10,410,415 |
|        | $31,300,462 |

<table>
<thead>
<tr>
<th>Accelerated Construction Scenario</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile Travel Time Value</td>
<td>$28,317,447</td>
</tr>
<tr>
<td>Truck Travel Time Value</td>
<td>$5,492,345</td>
</tr>
<tr>
<td><strong>Total Travel Time Value</strong></td>
<td><strong>$33,809,791</strong></td>
</tr>
<tr>
<td>Automobile Operating Cost</td>
<td>$8,472,075</td>
</tr>
<tr>
<td>Truck Operating Cost</td>
<td>$4,222,001</td>
</tr>
<tr>
<td><strong>Total Operating Cost</strong></td>
<td><strong>$12,694,076</strong></td>
</tr>
</tbody>
</table>
## Project Level Economic Screening Tool

### Construction Conditions

<table>
<thead>
<tr>
<th>Traditional Construction Parameters</th>
<th>Values</th>
<th>Accelerated Construction Parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Segment 1:</strong></td>
<td></td>
<td><strong>Segment 1:</strong></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td>450</td>
<td>Days</td>
<td>180</td>
</tr>
<tr>
<td>Segment Length</td>
<td>3</td>
<td>Segment Length</td>
<td>3</td>
</tr>
<tr>
<td>Average Operating Speed (Peak)</td>
<td>20</td>
<td>Average Operating Speed (Peak)</td>
<td>20</td>
</tr>
<tr>
<td>Average Operating Speed (Off-Peak)</td>
<td>50</td>
<td>Average Operating Speed (Off-Peak)</td>
<td>50</td>
</tr>
<tr>
<td>Percent of Traffic Diverted</td>
<td>5%</td>
<td>Percent of Traffic Diverted</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Segment 2:</strong></td>
<td></td>
<td><strong>Segment 2:</strong></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td>450</td>
<td>Days</td>
<td>185</td>
</tr>
<tr>
<td>Segment Length</td>
<td>3</td>
<td>Segment Length</td>
<td>3</td>
</tr>
<tr>
<td>Average Operating Speed (Peak)</td>
<td>20</td>
<td>Average Operating Speed (Peak)</td>
<td>20</td>
</tr>
<tr>
<td>Average Operating Speed (Off-Peak)</td>
<td>50</td>
<td>Average Operating Speed (Off-Peak)</td>
<td>50</td>
</tr>
<tr>
<td>Percent of Traffic Diverted</td>
<td>5%</td>
<td>Percent of Traffic Diverted</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Segment 3:</strong></td>
<td></td>
<td><strong>Segment 3:</strong></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td></td>
<td>Days</td>
<td></td>
</tr>
<tr>
<td>Segment Length</td>
<td></td>
<td>Segment Length</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Peak)</td>
<td></td>
<td>Average Operating Speed (Peak)</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
</tr>
<tr>
<td>Percent of Traffic Diverted</td>
<td></td>
<td>Percent of Traffic Diverted</td>
<td></td>
</tr>
<tr>
<td><strong>Segment 4:</strong></td>
<td></td>
<td><strong>Segment 4:</strong></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td></td>
<td>Days</td>
<td></td>
</tr>
<tr>
<td>Segment Length</td>
<td></td>
<td>Segment Length</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Peak)</td>
<td></td>
<td>Average Operating Speed (Peak)</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
</tr>
<tr>
<td>Percent of Traffic Diverted</td>
<td></td>
<td>Percent of Traffic Diverted</td>
<td></td>
</tr>
<tr>
<td>Traditional Construction Parameters</td>
<td>Values</td>
<td>Accelerated Construction Parameters</td>
<td></td>
</tr>
<tr>
<td>------------------------------------</td>
<td>--------</td>
<td>-------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Segment 1:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td>450</td>
<td>Days</td>
<td></td>
</tr>
<tr>
<td>Segment Length</td>
<td>3</td>
<td>Segment Length</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Peak)</td>
<td>20</td>
<td>Average Operating Speed (Peak)</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Off-Peak)</td>
<td>50</td>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
</tr>
<tr>
<td>Percent of Traffic Diverted</td>
<td>5%</td>
<td>Percent of Traffic Diverted</td>
<td></td>
</tr>
<tr>
<td><strong>Segment 2:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td>450</td>
<td>Days</td>
<td></td>
</tr>
<tr>
<td>Segment Length</td>
<td>3</td>
<td>Segment Length</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Peak)</td>
<td>20</td>
<td>Average Operating Speed (Peak)</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Off-Peak)</td>
<td>50</td>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
</tr>
<tr>
<td>Percent of Traffic Diverted</td>
<td>5%</td>
<td>Percent of Traffic Diverted</td>
<td></td>
</tr>
<tr>
<td><strong>Segment 3:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td></td>
<td>Days</td>
<td></td>
</tr>
<tr>
<td>Segment Length</td>
<td></td>
<td>Segment Length</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Peak)</td>
<td></td>
<td>Average Operating Speed (Peak)</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
</tr>
<tr>
<td>Percent of Traffic Diverted</td>
<td></td>
<td>Percent of Traffic Diverted</td>
<td></td>
</tr>
<tr>
<td><strong>Segment 4:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days</td>
<td></td>
<td>Days</td>
<td></td>
</tr>
<tr>
<td>Segment Length</td>
<td></td>
<td>Segment Length</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Peak)</td>
<td></td>
<td>Average Operating Speed (Peak)</td>
<td></td>
</tr>
<tr>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
</tr>
<tr>
<td>Percent of Traffic Diverted</td>
<td></td>
<td>Percent of Traffic Diverted</td>
<td></td>
</tr>
<tr>
<td>Construction Conditions</td>
<td>Accelerated Construction Parameters</td>
<td>Values</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td><strong>Segment 1:</strong></td>
<td>Days</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Segment Length</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Operating Speed (Peak)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Operating Speed (Off-Peak)</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percent of Traffic Diverted</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td><strong>Segment 2:</strong></td>
<td>Days</td>
<td>185</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Segment Length</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Operating Speed (Peak)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Operating Speed (Off-Peak)</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percent of Traffic Diverted</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td><strong>Segment 3:</strong></td>
<td>Days</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Segment Length</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Operating Speed (Peak)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percent of Traffic Diverted</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Segment 4:</strong></td>
<td>Days</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Segment Length</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Operating Speed (Peak)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Operating Speed (Off-Peak)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percent of Traffic Diverted</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Project Level Economic Screening Tool

<table>
<thead>
<tr>
<th>Traditional Construction Scenario</th>
<th>Accelerated Construction Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Calculates Road User Costs consisting of:</td>
<td>• Calculates Road User Costs consisting of:</td>
</tr>
<tr>
<td>• Travel Time Values</td>
<td>• Travel Time Values</td>
</tr>
<tr>
<td>• Vehicle Operating Costs</td>
<td>• Vehicle Operating Costs</td>
</tr>
</tbody>
</table>
Economic Loss

- Sales
- State Sales Tax Revenue
- Local Sales Tax Revenue

Project Level Economic Screening Tool
### Segment 4:

<table>
<thead>
<tr>
<th>Cost Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile Operating Cost (Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Automobile Operating Cost (Off-Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Truck Operating Cost (Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Truck Operating Cost (Off-Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Total Segment 4 Operating Cost</td>
<td>$0</td>
</tr>
<tr>
<td>Total Travel Time Value</td>
<td>$185,125,976</td>
</tr>
<tr>
<td>Total Operating Cost</td>
<td>$69,506,588</td>
</tr>
<tr>
<td>Total Road User Costs (Preconstruction - Construction)</td>
<td>$139,965,493</td>
</tr>
</tbody>
</table>

### Adjacent Businesses

#### Traditional Construction Scenario

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Sales</td>
<td>$16,740,000</td>
</tr>
<tr>
<td>Loss of State Sales Tax Revenue</td>
<td>$1,046,250</td>
</tr>
<tr>
<td>Loss of Local Sales Tax Revenue</td>
<td>$167,400</td>
</tr>
<tr>
<td><strong>Total Economic Loss</strong></td>
<td><strong>$17,953,650</strong></td>
</tr>
</tbody>
</table>

#### Accelerated Construction Scenario

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Sales</td>
<td>$6,789,000</td>
</tr>
<tr>
<td>Loss of State Sales Tax Revenue</td>
<td>$424,313</td>
</tr>
<tr>
<td>Loss of Local Sales Tax Revenue</td>
<td>$67,890</td>
</tr>
<tr>
<td><strong>Total Economic Loss</strong></td>
<td><strong>$7,281,203</strong></td>
</tr>
</tbody>
</table>

#### Traditional Construction Business Factor Overrides

<table>
<thead>
<tr>
<th>Factor Override</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Sales Percentage - Urban</td>
<td></td>
</tr>
<tr>
<td>Loss of Sales Percentage - Suburban</td>
<td></td>
</tr>
<tr>
<td>Loss of Sales Percentage - Rural</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot - Urban</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot - Suburban</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot - Rural</td>
<td></td>
</tr>
</tbody>
</table>

#### Accelerated Construction Business Factor Overrides

<table>
<thead>
<tr>
<th>Factor Override</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Sales Percentage - Urban</td>
<td></td>
</tr>
<tr>
<td>Loss of Sales Percentage - Suburban</td>
<td></td>
</tr>
<tr>
<td>Loss of Sales Percentage - Rural</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot - Urban</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot - Suburban</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot - Rural</td>
<td></td>
</tr>
</tbody>
</table>
### Segment 4:

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile Operating Cost (Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Automobile Operating Cost (Off-Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Truck Operating Cost (Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Truck Operating Cost (Off-Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Total Segment 4 Operating Cost</td>
<td>$0</td>
</tr>
<tr>
<td>Total Travel Time Value</td>
<td>$185,125,976</td>
</tr>
<tr>
<td>Total Operating Cost</td>
<td>$69,506,588</td>
</tr>
<tr>
<td>Total Road User Costs (Preconstruction - Construction)</td>
<td>$139,965,493</td>
</tr>
</tbody>
</table>

### Adjacent Businesses

#### Traditional Construction Scenario

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Sales</td>
<td>$16,740,000</td>
</tr>
<tr>
<td>Loss of State Sales Tax Revenue</td>
<td>$1,046,250</td>
</tr>
<tr>
<td>Loss of Local Sales Tax Revenue</td>
<td>$167,400</td>
</tr>
<tr>
<td><strong>Total Economic Loss</strong></td>
<td><strong>$17,953,650</strong></td>
</tr>
</tbody>
</table>

#### Accelerated Construction Scenario

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Sales</td>
<td></td>
</tr>
<tr>
<td>Loss of State Sales Tax Revenue</td>
<td></td>
</tr>
<tr>
<td>Loss of Local Sales Tax Revenue</td>
<td></td>
</tr>
<tr>
<td><strong>Total Economic Loss</strong></td>
<td><strong>Total Economic Loss</strong></td>
</tr>
</tbody>
</table>

### Traditional Construction Business Factor Overrides

<table>
<thead>
<tr>
<th>Factor Override</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Sales Percentage- Urban</td>
<td></td>
</tr>
<tr>
<td>Loss of Sales Percentage- Suburban</td>
<td></td>
</tr>
<tr>
<td>Loss of Sales Percentage- Rural</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot- Urban</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot- Suburban</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot- Rural</td>
<td></td>
</tr>
</tbody>
</table>

### Accelerated Construction Business Factor Overrides

<table>
<thead>
<tr>
<th>Factor Override</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Sales Percentage- Urban</td>
<td></td>
</tr>
<tr>
<td>Loss of Sales Percentage- Suburban</td>
<td></td>
</tr>
<tr>
<td>Loss of Sales Percentage- Rural</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot- Urban</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot- Suburban</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot- Rural</td>
<td></td>
</tr>
</tbody>
</table>
### Segment 4:

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile Operating Cost (Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Automobile Operating Cost (Off-Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Truck Operating Cost (Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Truck Operating Cost (Off-Peak)</td>
<td>$0</td>
</tr>
<tr>
<td>Total Segment 4 Operating Cost</td>
<td>$0</td>
</tr>
</tbody>
</table>

Total Travel Time Value: $82,375,459

Total Operating Cost: $28,030,032

Total Road User Costs (Preconstruction - Construction): $63,901,624

### Adjacent Businesses

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Sales</td>
<td>$6,789,000</td>
</tr>
<tr>
<td>Loss of State Sales Tax Revenue</td>
<td>$424,313</td>
</tr>
<tr>
<td>Loss of Local Sales Tax Revenue</td>
<td>$67,890</td>
</tr>
<tr>
<td>Total Economic Loss</td>
<td>$7,281,203</td>
</tr>
</tbody>
</table>

### Accelerated Construction Business Factor Overrides

<table>
<thead>
<tr>
<th>Factor Override</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Sales Percentage- Urban</td>
<td></td>
</tr>
<tr>
<td>Loss of Sales Percentage- Suburban</td>
<td></td>
</tr>
<tr>
<td>Loss of Sales Percentage- Rural</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot- Urban</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot- Suburban</td>
<td></td>
</tr>
<tr>
<td>Sales per Square Foot- Rural</td>
<td></td>
</tr>
</tbody>
</table>
Project Level Economic Screening Tool

### Results

<table>
<thead>
<tr>
<th>Traditional Construction Totals</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Road User Costs and Economic Loss</td>
<td>$157,919,143</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accelerated Construction Totals</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Road User Costs and Economic Loss</td>
<td>$71,182,826</td>
</tr>
</tbody>
</table>

#### Estimated User Costs and Economic Losses

![Bar chart showing estimated user costs and economic losses](chart.jpg)

<table>
<thead>
<tr>
<th>Traditional vs Accelerated</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in Road User Costs and Economic Loss</td>
<td>$86,736,317</td>
</tr>
<tr>
<td>Road User Cost and Economic Loss Daily Cost</td>
<td>$162,124</td>
</tr>
<tr>
<td>B/C of Accelerated Construction</td>
<td>28.91</td>
</tr>
</tbody>
</table>
Estimated User Costs and Economic Losses

Traditional vs Accelerated

<table>
<thead>
<tr>
<th></th>
<th>Traditional Construction Totals</th>
<th>Values</th>
<th>Accelerated Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Road User Costs and Economic Loss</td>
<td>$157,919,143</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Change in Road User Costs and Economic Loss

B/C of Accelerated Construction

Legend:
- Travel Time Value
- Operating Costs
- Loss of Sales
- Loss of Tax Revenue
- Cost to Accelerate
<table>
<thead>
<tr>
<th>Totals</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss</td>
<td>$157,919,143</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accelerated Construction Totals</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Road User Costs and Economic Loss</td>
<td>$71,182,826</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Traditional vs Accelerated</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in Road User Costs and Economic Loss</td>
<td>$86,736,317</td>
</tr>
<tr>
<td>Road User Cost and Economic Loss Daily Cost</td>
<td>$162,124</td>
</tr>
<tr>
<td>B/C of Accelerated Construction</td>
<td>28.91</td>
</tr>
</tbody>
</table>
• Project Selection and Planning
• Contracting Methods
• Design
• Contractor Selection
• Involvement of Contractor
• Construction Considerations
TxDOT RESOURCES

• Project Development Process Manual-2017
• Bridge Project Development Manual-2016
• PS&E Preparation Manual-2016
• Roadway Design Manual-2014
• Bridge Design Manual-2015
• Bridge Detailing Guide-2016
• Pavement Design Manual-2011
• Hydraulic Design Manual-2016
• Texas Manual on Uniform Traffic Control Devices -2014
• Accelerated Construction Strategies Guidelines – (Under Revision)
PROJECT SELECTION & PLANNING

• General Guides
• Economic Considerations
• ROW, Utilities, Environmental & Railroads
• Risk Assessment
• Public Information
• Other
General Guidelines

• FHWA
  • High Traffic - generally urban areas
  • Complete a “gap” in a highway system
  • Major project that will disrupt traffic
  • Major bridges out of service
  • Lengthy detour required
General Guidelines

• TxDOT-2003
  • Interstates with lane closures
  • Bridge closure
  • Road closure
  • Added capacity project
  • Non-freeway with ADT>10,000 & lane closures
  • Restrict access to schools, emergency services, etc.
  • Affect adjacent businesses
General Guidelines

• Rural areas
  • Impact on small towns traffic flow
  • Impact on small town businesses
  • Intersections

• Key transportation routes for major industries
  • Energy development
  • Agriculture
  • Mining
General Guidelines
• Two lane road widening (rural or suburban)
  • Lane widths
  • Shoulder widths
  • Limited ROW
  • Traffic control
  • Limited detours available
Economic Considerations

• Agency Administrative Costs
• Road User Costs
• Non-User Costs (adjacent businesses)
• Construction Costs
• Contractor Management Costs
Calculation Tools

- TxDOT Road User Cost Calculator
- Preliminary Economic Screening Tool
- Project Level Economic Screening Tool
- CA4PRS-construction alternatives
ROW, Utilities, Environmental & Railroads

- **ROW**
  - One side or both sides of project
  - Traffic handling
  - Work space
  - No. of parcels
  - Fencing, driveways, noise
  - Complete prior to start of construction
ROW, Utilities, Environmental & Railroads

- Utilities
  - Relocate prior to start of traffic disruption (if possible)
  - Relationships with utilities
  - Utility coordinator (contractor & TxDOT)

- Environmental, Historic Preservation & Archaeology
  - Complete prior to start of traffic disruption
  - Archaeology surprises

- Railroad
  - Coordination
  - Obtain access
Risk Assessment

- Identify potential problems
- Evaluate the severity of impact
- Provide alternative solutions
- Track events
Public Information

• Early and often

• Involve public during planning stages

• Short term inconvenience for long term convenience

• Use of coordinator
Alternative Contracting Types

Types –
5 methods best for accelerated construction (NCHRP 2008)

- Design-Build
- Interim Completion Dates
- No-Excuse Incentives
- Incentive/Disincentive
- Cost-Plus Time-Bidding

5 Methods NCHRP

Texas A&M Transportation Institute
Contracting Methods

Selection of Contracting Method

• Influencing factors in selection of method
  • Project size
  • Project type—new construction, rehabilitation, etc.
  • Project complexity
  • Critical completion time
Selection of Contracting Method

• Risks allocated to party best able to exercise control over risk

• Define work restrictions—work hours, vibrations, noise, environmental, etc.

• Designer, contractor and public agency work together
Contracting Methods

TxDOT Guides

• Calendar day definition for working day
• Incentive Using
  • Contract administration liquidated damages
  • Road user costs
• Milestones with Incentives/Disincentives
• Substantial Completion Incentives/Disincentives
• Lane Rental Disincentive
• A+B Provisions
• Design-Build
Contracting Methods

A+B Contracting

• A - Traditional bid for the unit prices multiplied by the contract quantities
• B - Time to complete the project x daily road user costs
• Road user costs provided by TxDOT
• Contract state minimum and maximum work days
• Contractors bids “time” is the “time” used for contract cost adjustments

A + B

Texas A&M Transportation Institute
Contracting Methods

A+B Contracting

• Consider user and non-user costs
• Estimated value of B should not be more than 40% of A
• Constructability reviews

![Typical Road User Costs]

$5,000

$10,000
DESIGN

• General Considerations
• Geometric Design
• Bridge Design
• Drainage Design
• Pavement Design
• Roadside Safety Design
• Traffic Control and Job Sequencing
• Project Duration
General Considerations

- Minimize mobilization/demobilization
- Minimize materials logistics
- Minimize profile changes
- Repeatable features
DESIGN

Geometric Design
- Consider construction sequencing, traffic handling, construction work space needs

Traffic handling
- Same No. of lanes during construction
- Wide as possible lanes
- Use of shoulders to handle traffic

- Detours and shoulder widths
- Future lane expansion
- Constructability reviews
DESIGN

Bridge Design

- TxDOT active in Accelerated Bridge Design
- Consult with experts in TxDOT (Divisions & Districts)
- Time consuming element of a project
- Off site manufacturing of bridge components
- Lead time for materials and fabrication
- Strength gain of PCC
- Bridge rail constructability
- Constructability review
Drainage Design

- Consider constructability
- Type of conduits
- Type of structures
- Interference with utilities
- Retrofit existing conduits
- Constructability review
Pavement Design
• Evaluate condition of existing pavement
• Recycle existing materials
• Minimize moving materials
• Reuse detour materials
• Locate production plants on job site
• Stabilize materials
• High load carrying capacity materials
• Constructability review
Roadside Safety Design

- Use TxDOT manuals
- Constructability review
DESIGN

Traffic Control and Job Sequencing

• Texas Manual on Uniform Traffic Control Devices
• Deployment and removal time for traffic control devices
• Design for safety (speed if possible as public will push the speed limits)
• Constructability review
DESIGN

Project Duration

• Need accurate estimate
• Incentives/disincentives dependent on duration
• Consult with contracting community
Project Duration

• ROW, utilities, environmental, archeology, railroads
• Completeness of plans and specifications
• Quantities of work
• Impacts of weather
• Temperature and time requirements for certain materials
• Vegetation establishment and time of year
• Materials availability
• Production rates
• Consult with contracting community
CONTRACTOR SELECTION

TxDOT Prequalification

• Confidential Questionnaire
  • Audited financial statement
  • Completion of questionnaire

• Bidder’s Questionnaire
  • Confidential questionnaire waived
  • Smaller projects, routine maintenance, emergency, specialty projects
Contractor Selection

Possible Future Considerations

• Quality
• Past performance
• Safety
• Special technical capabilities
• Key personnel
Involvement of Contractor

• Planning and Design Reviews
• Partnering
• Workforce
Planning and Design Reviews

• More early and detailed reviews by TxDOT
• Provide state wide resource of experienced engineers, etc.
• Include contractors, materials suppliers, fabricators, equipment manufacturers, transportation companies
INVOLVEMENT OF CONTRACTOR

Partnering

• Agreement to
  • Solve issues at low level in organizations
  • Openness to change as information becomes available
  • Attention to detail
  • Focus on project with unselfish effort
  • Take steps to insure that no interruptions take place
  • Co-locate key personnel on project
  • Empower workforce to make immediate decisions
  • Technical expertise on job site or immediately available
  • Include all stakeholders-TxDOT, contractors, materials suppliers, fabricators, local governments, utility companies, trucking companies
INVolVEMENT OF CONTRActor

Workforce
• Extended hours
• Rapid pace
• Worker fatigue
• Redundant critical personnel
• Hand-off work between shifts
• Equipment maintenance
CONSTRUCTION CONSIDERATIONS

• General Considerations
• Work Plan and Work Sequence
• Workforce
• Work Space
• Equipment
• Quality Control/Quality Assurance
• Information Exchange
CONSTRUCTION CONSIDERATIONS

General Considerations

• “We Build Texas—Field Guide to Successful Project Delivery”

• Key elements of successful project
  • Safety
  • Money
  • Timeliness
  • Relationships
  • Perception
  • Quality
General Considerations

- Activities that produce successful project
  - Contract Relationships
  - Activities Prior to Letting
  - Post-Letting to Contractor Start Activities
  - Construction Start to Contract Completion Activities
CONSTRUCTION CONSIDERATIONS

Work Plan and Work Sequence

- Extremely important for success
- Marriage of time, space, traffic control and construction operations
- Advanced scheduling tools
- Adjust plan as work progresses
CONSTRUCTION CONSIDERATIONS

Workforce

• Decision makers on the project
• Co-location of decision makers
• Decision making at as low a level in organizations as possible
• Proper skill sets (technical/labor workforce) available
• Quality control workforce
CONSTRUCTION CONSIDERATIONS

Workspace

• On project for removal and placement of materials
• Adjacent to project for staging of materials and equipment
CONSTRUCTION CONSIDERATIONS

Equipment

• Correct equipment to perform job
• Maintained and operational
• Key equipment back-ups
• New equipment may need to be developed
Quality Control/Quality Assurance

- Personnel with adequate skill set (certified)
- Testing equipment and laboratory (accredited)
- Quality cannot be sacrificed because of speed of construction
- New equipment may need to be developed
- Decisions on acceptance of materials made on job
CONSTRUCTION CONSIDERATIONS

Information Exchange

• Information flow at rapid rate
• Electronic files and transmission of information
• Set required meeting times
• Special meetings as required
• Solve and avoid problems with communication
Summary

• Project Selection and Planning
• Contracting Methods
• Design
• Contractor Selection
• Involvement of Contractor
• Construction Considerations
ACCELERATED BRIDGE CONSTRUCTION IN TEXAS (AND BEYOND)

Walter (Ray) Fisher – Dallas District
Prapti Sharma – Fort Worth District
Graham Bettis – Bridge Division
Accelerated Bridge Construction (ABC) Techniques

1. Prefabricated Elements
2. Self Propelled Modular Transporters (SPMTS)
3. Lateral Slide-in Bridge Construction
4. Modular Units

Photo Courtesy of FHWA
Prefabricated Elements

- TxDOT’s primary technique for accelerated bridge construction.
- In addition to increased speed, also typically comes with increased quality.
- Can encompass practically every element from the ground up.
Precast Bent Caps
Precast Abutments
Precast Columns
TxDOT’s Bread & Butter: Girders and Deck Panels
Lake Ray Hubbard Precast Bent Caps
Lake Ray Hubbard Precast Bent Caps
Dallas High Five Interchange
Dallas High Five Interchange
Dallas High Five Interchange
Moving Forward

- Prefabricated elements are largely what make TxDOT bridges the least expensive and most durable in the country. Keep it up!
- Prefabricated elements typically speed up construction considerably, but by themselves do not really constitute “Accelerated Bridge Construction.”
- Now let’s talk fast!
Decked Slab Beams: 6 – 10 Day Construction Projects

- Precast Abutment
- Precast Bent Cap
- Decked Slab Beams
- Steel Piling
FM 4 at Salt Creek
Self Propelled Modular Transporters (SPMTS)

Photos Courtesy of Heavy Equipment Guide
Photo Courtesy of FHWA
West 7th Street Bridge in Fort Worth

- Out of service 150 days maximum. Typical construction time = 12 to 18 months.
- $33,000 per day incentive/disincentive.
- Floor beams and deck panels fabricated in precast yard.
- Arches cast offsite (but nearby), then moved to site using SPMTS.
West 7th Street Bridge in Fort Worth
West 7th Street Bridge in Fort Worth
West 7th Street Bridge in Fort Worth
West 7th Street Bridge in Fort Worth

- Projected traffic closure was 150 days.
- Finished 26 days ahead of schedule.
Full Width, Full Depth Panels
Full Width, Full Depth Panels
Full Width, Full Depth Panels
Lateral Slide-in

Photo Courtesy of FHWA
Lateral Slide-in

Photo Courtesy of FHWA
Lateral Slide-in

Photo Courtesy of FHWA
Modular Units
Modular Units
Modular Units
I-93 Fast 14 in Boston
I-93 Fast 14 in Boston

New Bearing Seat

Existing Cap
West Dallas St. in Houston
West Dallas St. in Houston
Entities or individuals that copy and present state agency information must identify the source of the content, including the date the content was copied. Entities or individuals that copy and present state agency information on their websites must accompany that information with a statement that neither the entity or individual nor the information, as it is presented on its website, is endorsed by the State of Texas or any state agency. To protect the intellectual property of state agencies, copied information must reflect the copyright, trademark, service mark, or other intellectual property rights of the state agency whose protected information is being used by the entity or individual. Entities or individuals may not copy, reproduce, distribute, publish, or transmit, in any way this content for commercial purposes. This presentation is distributed without profit and is being made available solely for educational purposes. The use of any copyrighted material included in this presentation is intended to be a “fair use” of such material as provided for in Title 17 U.S.C. Section 107 of the U.S. Copyright Law.
ACCELERATED CONSTRUCTION
STRATEGIES
DESIGN CONSIDERATIONS

Lacey Rodgers, PE, CFM – Dallas District
<table>
<thead>
<tr>
<th></th>
<th>Design Considerations</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Traffic Control Plan &amp; Contract Time Determination</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Quality PS&amp;E</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Ready to Let (RTL)</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>Delivery Methods</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>Incentive/Disincentive for Milestone Work</td>
<td>8-12</td>
</tr>
<tr>
<td>7</td>
<td>Cost + Time Bidding (A+B Bidding)</td>
<td>13-15</td>
</tr>
<tr>
<td>8</td>
<td>Questions &amp; Answers</td>
<td>16</td>
</tr>
</tbody>
</table>
Design Considerations

- Minimize Profile change to reduce earthwork.
- Balancing earthwork within the job
- Repeatable features
  - Curb
  - Curb ramp
  - Pavement design
  - Inlet type
- Specify Precast where logical
- Stay Standard
Traffic Control Plan & Contract Time Determination

Traffic Control Plan
- Project location & traffic patterns
- Access needs
- Minimize mobilization/de-mobilization
- Availability of existing pavement for detour
- Long lead items
- Material delivery
- Lane closure restrictions
- Onsite detour options
- Unclear ROW/Utilities

Contract Time Determination
- Realistic time determination
- Long lead items
- Weather
- Lane closure restrictions
- Season-dependent items
  - Vegetative establishment
  - Concrete pours
- Appropriate time of year for letting
- Conduct a CTD meeting with Construction and Area Office
Quality PS&E

Comprehensive Plan Review

- DSRT (District Safety Review Team)
  - Conceptual TCP roll plots
- Constructability Review
- District wide Plan Review – 30%, 60%, 95%
- General Notes
- Specifications
- Plan Sheet notes

- RCLS – Review Comments Logging System
- Early Contractor involvement
  - FTP/Sharepoint
  - Feedback
Ready to Let (RTL)

- 100% PS&E
  - Free of outstanding comments
- Environmental Clearance
- Right-of-way Clear
- Encroachments Clear
- Relocation Clear
- Utilities Clear
- Rail Road Agreement in Place
- Other Agreements
Delivery Methods

- **Design Bid Build**
  - Incentive and Disincentive for Milestone Work
    - User Costs and Duration defines value
  - A+B bidding
    - Cost + time bidding

- **Design build**
  - 2 large projects Horseshoe and Southern Gateway
Incentive/Disincentive for Milestone Work

- User Costs and Duration defines value
- Communicated in TCP & Contract Time Determination

<table>
<thead>
<tr>
<th>Letting Date</th>
<th>CSJ</th>
<th>Road</th>
<th>Type</th>
<th>Daily RUC</th>
<th>Begins</th>
<th>Ends</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun-17</td>
<td>2374-04-049</td>
<td>IH 20</td>
<td>Disincentive</td>
<td>$3,500.00</td>
<td>When the number of lanes available to traffic on Carrier Parkway is reduced from existing as shown in TCP Phase 4 Stage 1</td>
<td>When all lanes on Carrier Parkway open to traffic and match the final, proposed conditions</td>
<td>293 Days Permitted</td>
</tr>
<tr>
<td>May-17</td>
<td>0261-02-074</td>
<td>US 67</td>
<td>Disincentive</td>
<td>$2,000.00</td>
<td>When the northbound entrance from Belt Line Road closes to traffic as shown in TCP Phase 2 Stage 1</td>
<td>When the northbound entrance from Belt Line Road opens to traffic as shown in TCP Phase 3 Stage 1</td>
<td>Closure Permitted 30 Days</td>
</tr>
<tr>
<td>May-17</td>
<td>0261-02-074</td>
<td>US 67</td>
<td>Incentive/Disincentive</td>
<td>$1,500.00</td>
<td>When the northbound exit to Wheatland Road closes to traffic as shown in TCP Phase 3 Stage 1</td>
<td>When the northbound exit to Wheatland Road opens to traffic as shown in TCP Phase 3 Stage 2</td>
<td>Closure Permitted 75 Days, 30 Days of Incentive Permitted</td>
</tr>
<tr>
<td>Letting Date</td>
<td>CSJ</td>
<td>Road</td>
<td>Type</td>
<td>Daily RUC</td>
<td>Begins</td>
<td>Ends</td>
<td>Duration</td>
</tr>
<tr>
<td>--------------</td>
<td>---------</td>
<td>--------</td>
<td>---------------------------</td>
<td>-----------</td>
<td>-------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Jul-16</td>
<td>0095-02-102</td>
<td>US 80</td>
<td>Incentive/Disincentive</td>
<td>$1,000.00</td>
<td>Commencement of construction work called out in Phase 3 of the Traffic</td>
<td>Completion of all work shown in Phase 3 of the Traffic Control Plan and the opening of all travel lanes</td>
<td>126 Days, 30 Days maximum for incentive</td>
</tr>
<tr>
<td>Dec-15</td>
<td>0047-14-069</td>
<td>US 75</td>
<td>Incentive/Disincentive</td>
<td>SP Item 000-001</td>
<td>Contract Time Charges Begin</td>
<td>Project is Substantially completed</td>
<td>858 (refer to SP 008-006 for incentive max days)</td>
</tr>
<tr>
<td>Dec-15</td>
<td>0047-14-069</td>
<td>US 75</td>
<td>Incentive/Disincentive</td>
<td>$1,000.00</td>
<td>When traffic on FM 455 is shifted north and barrier is placed, as shown in TCP Phase 1 Stage 1</td>
<td>When construction of the FM 455 bridge over US 75 is completed and traffic on FM 455 is shifted to utilize both sides of the new structure, as shown in TCP Phase 2 Stage 1</td>
<td>208 (refer to SP 008-006 for incentive max days)</td>
</tr>
<tr>
<td>Aug-15</td>
<td>0048-04-079</td>
<td>IH 35E</td>
<td>Incentive/Disincentive</td>
<td>$1,000.00</td>
<td>When the bridge or approach roadways carrying Brookside over IH 35E close to traffic</td>
<td>When the new bridge and approach roadways carrying Brookside over IH 35E open to traffic</td>
<td>Closure Permitted 60 Days, 20 Day of Incentive Permitted</td>
</tr>
</tbody>
</table>
Limits: From Egyptian Way to Conflans Road

Milestone Incentive / Disincentive – Road user and loss toll revenue costs

A. Incentive Milestone One - Partial open in both directions from/to limits defined.
   - $3M – If on or before date (1)
   - $40K daily every day after date (1)
   - No Incentive after date (2) specified

B. Incentive Substantial Completion of Work - Work requiring any closures is complete.
   - $10M - No Excuse Bonus on or before date (3)
   - $200K daily every day after date (3)
   - No Incentive after date (4) specified

C. Disincentive – Failure to not substantially Complete work on time
   - $40k daily after date (4)

D. Liquidated damages – failure to complete work on time.
Challenges

**Design**
- Short completion turn around
- 2 Hydrologic reports & CDC for FEMA Zone AE
- Project limits changed (lengthened) during design

**Construction**
- Landfill
- Poor soils
- Pressure to open for Superbowl XLV February 6, 2011
Sucesses

- Design
  - Utilizing consultants to bridge gaps & SME in design
  - Regular communication with City of Grand Prairie
  - TCP & Intermediate striping
  - Quality Plans

- Construction
  - Pre – Bid meeting
  - Quality Plans
  - Clear Contract time Determination
  - Clear defined Special Provision
  - Incentive/disincentive/liquidated damages
  - Good Construction team
  - Achieved an open to traffic for Super Bowl XLV February 6, 2011
Cost + Time Bidding (A+B Bidding)

- A combination criteria for selecting the winning bid for a construction project
  - A: Traditional cost bid
  - B: Bid Days = (Contract Duration)
    - Contract duration (or substantial completion)
    - Milestone duration
    - Combination
- $A + (B \times \text{daily road-users cost}) = \text{Bid value}$
- Bid Awarded to the Lowest bid value

<table>
<thead>
<tr>
<th>Bidder</th>
<th>Bid Amount (A)</th>
<th>Bid Days (B)</th>
<th>Daily RUC</th>
<th>Bid Value (A+B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$20,300,000</td>
<td>230</td>
<td>$50,000</td>
<td>$31,800,000</td>
</tr>
<tr>
<td>B</td>
<td>$20,450,000</td>
<td>220</td>
<td>$50,000</td>
<td>$31,450,000</td>
</tr>
<tr>
<td>C</td>
<td>$21,700,000</td>
<td>200</td>
<td>$50,000</td>
<td>$31,700,000</td>
</tr>
</tbody>
</table>
Benefits of A+B Bidding

- Competitive bidding yields optimization of cost + time savings
  - Not just the lowest cost or the shortest time
- Generally the winning bid saves both time and cost over the Engineer’s estimate
  - Daily RUC value impacts schedule and cost bids
- Encourages potential bidders to develop carefully developed plans
  - Owner benefits from time and/or cost savings
## Summary of Dallas District A+B Projects (2013–2016)

<table>
<thead>
<tr>
<th>Letting Year</th>
<th>County</th>
<th>Job #</th>
<th>CCSJ #</th>
<th>Daily RUC $</th>
<th># of Bids</th>
<th>A (Bid Items $)</th>
<th>Time Estimate (Days)</th>
<th>B (Days × DRUC $)</th>
<th>A (Bid Items $)</th>
<th>% O/U (A)</th>
<th>Time Estimate (Days)</th>
<th>% O/U (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May. 2013</td>
<td>Denton</td>
<td>3201</td>
<td>2054-02-016</td>
<td>$2,590</td>
<td>12</td>
<td>$23,735,281</td>
<td>506 Days</td>
<td>$1,310,540</td>
<td>$23,602,199</td>
<td>-1%</td>
<td>416 Days</td>
<td>-18%</td>
</tr>
<tr>
<td>Jul. 2013</td>
<td>Dallas</td>
<td>3212</td>
<td>0092-07-045</td>
<td>$1,000</td>
<td>2</td>
<td>$281,696</td>
<td>35 Days</td>
<td>$35,000</td>
<td>$448,138</td>
<td>59%</td>
<td>35 Days</td>
<td>0%</td>
</tr>
<tr>
<td>Jan. 2017</td>
<td>Ellis</td>
<td>3002</td>
<td>0172-08-053</td>
<td>$3,300</td>
<td>7</td>
<td>$71,229,336</td>
<td>730 Days</td>
<td>$2,409,000</td>
<td>$61,704,500</td>
<td>-13%</td>
<td>687 Days</td>
<td>-6%</td>
</tr>
<tr>
<td>May. 2017</td>
<td>Dallas</td>
<td>3004</td>
<td>0261-02-074</td>
<td>$20,000</td>
<td>11</td>
<td>$59,686,407</td>
<td>702 Days</td>
<td>$14,040,000</td>
<td>$59,011,998</td>
<td>-1%</td>
<td>468 Days</td>
<td>-33%</td>
</tr>
<tr>
<td>Jun. 2017</td>
<td>Dallas</td>
<td>3001</td>
<td>0196-03-268</td>
<td>$50,000</td>
<td>5</td>
<td>$72,032,008</td>
<td>780 Days</td>
<td>$39,000,000</td>
<td>$78,786,039</td>
<td>9%</td>
<td>618 Days</td>
<td>-14%</td>
</tr>
</tbody>
</table>

- For 3 out of 5 contracts, the “A” part of the bid was under the Engineer’s cost estimate.
- For 4 out of 5 contracts, the “B” part was under the Engineer’s duration estimate.
- The winning bid for 0196-03-268 had the second lowest “A” bid.
Thank You!

For more information, please feel free to contact:

Lacey Rodgers, PE, CFM
Director, Project Delivery Office
TxDOT, Dallas District
Lacey.Rodgers@txdot.gov
(214) 320-6146

Nabeel Khwaja, PE, MS
The University of Texas at Austin, Center for Transportation Research
TxDOT, Dallas District Construction
Nkhwaj-C@txdot.gov
(214) 320-6188

Thanks to Rene Garcia and Suja Mathew for assistance in slide content.
ACCELERATED CONSTRUCTION STRATEGIES
TRAFFIC AND SAFETY
Traffic and Safety Considerations - Lane Rental Fees for Lane Closures

- Lane rental fees and liquidated damages for lane closures
- Primarily used on our Design-Build projects, but are also used on our larger Design-Bid-Build projects with freeway lane closures.
- Time periods established in the contract for various volumes of traffic
  - Time Period A = peak hour/highest volume of traffic
  - Time Period B = not peak hour but heavier volumes than overnight hours
  - Time Period C/D = lowest traffic volumes (typically overnight)
**Traffic and Safety Considerations- Lane Rental Fees for Lane Closures**

- $ values are assigned for each time period based on the number of lanes closed.
  - Lane rental fee bank balance is established in the contract in which lane closure fees are deducted from the bank balance.
  - Lane closures beyond the bank balance are deducted from the monthly estimate.
  - Time Period A lane closures are not allowed, but a dollar value is assigned in the event that an overnight lane closure is not picked up on time. These do not come out of the bank balance, but are deducted monthly from the estimate.
Traffic and Safety Considerations - Lane Rental Fees for Lane Closures

- Dallas Horseshoe Project- example lane rental fee charges:

**Westbound IH 30 Lane Fees/Liquidated Damages**

<table>
<thead>
<tr>
<th>Hour</th>
<th>Sun</th>
<th>M - T</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>010</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>020</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>030</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>040</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>050</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>060</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>070</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>080</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>090</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>190</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>210</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>220</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>230</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lane Fees &amp; Liquidated Damages</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Lane</td>
<td>$10,096</td>
<td>$1,010</td>
<td>$50</td>
</tr>
<tr>
<td>Two Lane</td>
<td>$20,193</td>
<td>$10,096</td>
<td>$505</td>
</tr>
<tr>
<td>Three - Full</td>
<td>$50,482</td>
<td>$25,241</td>
<td>$5,048</td>
</tr>
</tbody>
</table>
Traffic and Safety Considerations - Lane Rental Fees for Lane Closures

- Dallas Horseshoe Project - example lane rental fee charges:

### Northbound IH 35E Lane Fees/Liquidated Damages

<table>
<thead>
<tr>
<th>Hour</th>
<th>Sun</th>
<th>M - T</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td>0:00</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>C</td>
</tr>
<tr>
<td>1:00</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>2:00</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>3:00</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>4:00</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>5:00</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>6:00</td>
<td>D</td>
<td>A</td>
<td>A</td>
<td>D</td>
</tr>
<tr>
<td>7:00</td>
<td>C</td>
<td>A</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>8:00</td>
<td>C</td>
<td>A</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>9:00</td>
<td>C</td>
<td>A</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>10:00</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>11:00</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>12:00</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>13:00</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>14:00</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>15:00</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>16:00</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>17:00</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>18:00</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>19:00</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>20:00</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>21:00</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>22:00</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>23:00</td>
<td>D</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lane Fees &amp; Liquidated Damages</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Lane</td>
<td>$10,96</td>
<td>$202</td>
<td>$50</td>
<td></td>
</tr>
<tr>
<td>Two - Full</td>
<td>$50,048</td>
<td>$5,048</td>
<td>$2,019</td>
<td></td>
</tr>
</tbody>
</table>
Traffic and Safety Considerations- Lane Rental Fees for Lane Closures

- Dallas Horseshoe Project- example lane rental fee charges:
  - Full westbound I-30 closure from 11pm Friday to 8am Saturday:
    * 9 hours of Time Period C
    * $9 x $5,048 = $45,432
  - Full northbound I-35E closure from 10pm Friday to 6am Saturday:
    * 3 hours of Time Period C
    * 5 hours of Time Period D
    * $(3 x $5,048) + (5 x $2,019) = $25,239
  - Total lane rental fees deducted from the bank balance = $70,671
- **Dallas Horseshoe Project- example lane rental fee charges:**
  - Work Completed that evening:
    - Set 7 Tx62 girders over westbound I-30 on Bridge 45
    - Set 8 Tx62 girders over northbound I-35E on Bridge 10
    - Placed temporary shoring and work platform for Houston Street arches, decking, and railing
    - Removed bridge overhangs for completed Jefferson Street railing.
    - Removed existing high mast illumination pole
    - Placed 1000 lf of portable concrete barrier
- Dallas Horseshoe Project- example lane rental fee charges:
  - Work Completed that evening:

  - 2 spans of Bridge
  - 10 girders set the same night
  - Bridge 45 girders set that night
  - Temporary shore towers and work platform set for Houston Street work
  - Overhangs were removed for completed Jefferson Street bridge rail
Traffic and Safety Considerations- Lane Rental Fees for Lane Closures

- Dallas Horseshoe Project- example lane rental fee charges:
  - Work Completed that evening:
Traffic and Safety Considerations - Lane Rental Fees for Lane Closures

- Dallas Horseshoe Project - example lane rental fee charges:
  - Work Completed that evening:
Traffic and Safety Considerations- Lane Rental Fees for Lane Closures

- Dallas Horseshoe Project- example lane rental fee charges:
  - Work Completed that evening:
Traffic and Safety Considerations - Lane Rental Fees for Lane Closures

- Dallas Horseshoe Project - example lane rental fee charges:
  - Work Completed that evening:
Traffic and Safety Considerations- Lane Rental Fees for Lane Closures

- Dallas Horseshoe Project-
  - Lane Rental Fee Bank Balance = $2.4 million
  - Results:
    - Majority of lane closures were completed overnight, very few single lane closures during the day on the weekend
    - All full closures were completed in overnight hours (majority on Friday and Saturday nights)
    - No full closures needed during the day on the weekend
    - Work during closures was maximized and multiple activities and crews worked safely within the closures.
    - Not a single lane closure was not picked up by Time Period A/the peak hour
    - Overall we believe we have reduced the impact to the traveling public
Traffic and Safety Considerations- Lane Rental Fees for Lane Closures

- Dallas Horseshoe Project-
  - Other closures with multiple crews:
Traffic and Safety Considerations- Lane Rental Fees for Lane Closures

- Dallas Horseshoe Project-
  - Other closures with multiple crews:
Questions
ACCELERATED CONSTRUCTION WORKSHOP

Public Information Best Practices

Tony Hartzel, PIO Supervisor, Dallas District

June 13, 2017
# Table of Contents

1. Overview
   - Pages 2-3
2. Horseshoe Project
   - Pages 4-5
3. Midtown Express/DFW Connector
   - Pages 6-7
4. 35Express
   - Pages 8-9
5. Past Projects
   - Page 10
6. Tools in the Toolbox
   - Pages 11-12
7. Lessons Learned
   - Page 13
Outreach Overview

- Major Projects since 2009
  - DFW Connector
  - North Tarrant Express
  - LBJ Express
  - Dallas Horseshoe
  - 35Express
  - Midtown Express
  - Southern Gateway (2018)
  - (Others SH 360, 35W Segment 3A)

- Some general rules apply, but constituents and outreach needs vary by corridor

- Best practices have developed over the years -- Social media, project hotlines, project websites and storefronts
Outreach Highlights – Dallas Horseshoe

- Heart of downtown Dallas: 450,000 vehicles per day
- Heavy emphasis on mass messaging
  - Video traffic alerts
  - Quarterly digital newsletter
- Virtual meetings/town halls
  - Promoted via social media
  - Chat online with project managers
  - Small audience, but larger than physical town hall meetings
- Honorable mention in AASHTO TransComm 2015 competition
- WTS-DFW Innovative Transportation Solutions Award
Outreach Highlights – Dallas Horseshoe

- Limited demand for direct outreach (town halls, chamber briefings)
- Meet individually with affected property owners during construction phases
- Understand your audience and find ways to get them the information
  - Text alerts – with images
  - Social media
  - Weekly e-blasts with up-to-date lane closure information
Outreach Highlights – DFW Connector/Midtown Express

- Mid-cities major projects
- More residential and small business
- Set the standard for:
  - Website
  - E-alerts
- Business Owner Task Force
  - Give those directly affected a targeted, monthly briefing
  - Unwind the Vine effort
  - Ask questions and provide feedback
  - Buy-in from potential opponents
  - Meetings on Midtown Express moved to various locations to encourage attendance
Outreach Highlights – DFW Connector/Midtown Express

- TxDOT’s first-ever mobile app (DFW Connector)
  - More than 10,000 downloads on DFW Connector app
  - Real-time push notifications
  - Real-time Google map updates showing corridor conditions
  - List of current closures and project updates
- Pace of construction requires constant updates
- Open houses for community fosters trust and support
- Attendance at community events
- Always adapt
  - Lane closure notifications modified over time
  - Text alerts for major incidents
  - Storefront hours
Outreach Highlights – 35Express

- 30 miles from Dallas to Denton
- Nine cities and two counties
  - Greater need for targeted, direct stakeholder outreach
  - What happens in Denton does not necessarily affect Dallas commuters
- Project divided into three segments
  - Outreach tailored to those geographic areas
  - Intense effort at outset created strong relationships with local leaders
  - Quarterly project update/community meetings
- Meet directly with cities and counties
  - Regular briefings at council meetings
  - Regular briefings with first responders
  - Monthly, city-specific updates provided to city councils
Outreach Highlights – 35Express

- Award-winning website and outreach
  - American Road and Transportation Builders Association Pride Award
- Barrel monsters effort generated positive coverage
- #SafeDrive35 social media campaign
- Challenges due to project phasing
  - AGL nearing completion on Phase 1, TxDOT will construct Phase 2, date TBD
  - Stay in your lane, answer your questions or get someone from the other team to answer
Outreach Highlights – Other Projects

- LBJ Express
  - LBJ Marketplace, targeted business retention effort
  - First project to attempt electronic town hall
  - Extensive use of text traffic alerts

- North Tarrant Express
  - Two projects: SH 183/I-820 and I-35W (ongoing)
  - Six cities on initial project
  - One-on-one, targeted communications worked best
  - Less focus on community events and open houses
Summary of Tools in the Box – Tray 1

- Public Project Storefronts
- Websites
- Press Releases
- Dedicated Hotline Telephone Numbers
- Email and Telephone Responses to Public Concerns, Complaints, Comments, and Praise
- Email Subscription to Lane Closures, Incident Notification and Project Updates
- Text Alerts for Lane Closures and Major Incidents
- Social Media (Facebook, Twitter) for Lane Closures and Incident Notification
- Detour Maps/Aerial Photographs/Visualizations
Summary of Tools in the Box – Tray 2

- Smartphone Apps
- Newsletters and Project Trackers
- Business Owner Task Force Meetings
- Virtual Meetings/Town Halls/Open Houses
- Personal Meetings with City Elected Officials and Staff
- Personal Meetings with Adjacent and Affected Businesses
- Presentations to Local Community Groups
- Participation in Community Fairs and Festivals
- Coordination with PIO Staff at Sister Entities
Lessons Learned

- Be adaptable
  - Outreach practices can vary by project
  - Find what works for your stakeholders
- Compressed review times for materials
- Major projects are a laboratory for outreach methods
- TxDOT PIO assigned to each project
  - Meets weekly or more frequently as needed
  - Communications team approach
- Don’t forget about the technical provisions
  - Update TPs after every project
  - Build upon past history
Accelerated Construction Workshop

PHILLIPPE FALKNER – ED BELL CONSTRUCTION
Roads – Faster! Like this right???
There’s no magic wand or silver bullet

- It’s about reducing critical path activities.
- It’s about keeping utility delays out of your schedule.
- It’s about simplifying the design.
- It’s about seeing the bigger picture.
- It’s about avoiding red tape.
- It’s about checking your ego at the door.
- It’s about being proactive instead of reactive.
- It’s about keeping an open mind. It can be done. We’ve done it and lived to tell the tale.
Three approaches for success

- Design and Construction methods
- Rules and Regulations
- Partnering and Project Delivery
Design and Construction Methods
Accelerating key phases or intersections: weekends work

- Be prepared before you get to the need to do it. Have alternate subgrade designs, pricing, and mechanisms in place to use on the fly. Much better to bid it in than change order it in.
- Even if a project section is designed with lime or cement, consider flexible base for subgrade...or no subgrade at all.
- HES concrete is underutilized. It's not just for concrete paving. Inlet throats, flowable fill with accelerator in lieu of CSB at abutments, just about any non-HPC concrete is an option.
- Maturity meters are a vastly underutilized tool.
Removal of subgrade and increasing concrete depth
Avoid utility delays when possible…and probable

- The Department in conjunction with the contractor can ALWAYS move faster than a franchise utility...if they are willing to do so.
- Don’t be afraid to think WAY out of the box on rerouting foundations, structures, utilities, etc. Additional construction costs are almost always cheaper than utility delay claims, plus added time for the public.
- Quit asking “Do we have a pay item?” or “What is the standard?”. Start asking “What will solve the problem?” and “What will work?”
- On a project in Dallas County (with 31 separate franchise utilities), contractor field fit drainage laterals on a daily basis under force account, under supervision from an engineer, to progress laterals around live utilities.
Hampton/Inwood Road

Both lines - Level III Communications

6" water line - City of Dallas

8" gas line - Atmos

Both lines - Level III Communications

2" unknown utility

8" gas line - Atmos

SBC telephone cable
Hampton/Inwood Road
Simpler designs = faster construction

- Curb and Gutter templates should rest on the subgrade, with an adjacent section of HMAC. Avoid placing HMAC under AND adjacent to a curb and gutter section. This generates a second HMAC mobilization.

- Try to avoid using multiple types or classes of HMAC in a section. Most vendors only run one type of mix in a silo per day. Slows down production rates.

- Think about roadway geometry, especially as it relates to structures. Just because it can be done, is it necessary? Will it add additional low production work, especially in the superstructure? Does it add falsework or additional critical path activities, like haunch build up?

- Use of common paving widths where possible. Reduce the need for machine and formwork changes. Make the process repeatable.

- Bridge rail: stick to what can be slip formed, gets done in less than 20% of the time.
Sometimes, it’s about getting out the checkbook....

- Sometimes it makes sense to pay for all the PCTB upfront, to work in all available areas.
- Utilize available PCTB types, understand fabrication times and limited vendors.
- Stamped traffic control plans: figure out who can do them quicker, and don’t be married to either party doing them. It’s about keeping the project moving.
- Certain types of shoring open new and available work areas in an instant.
- Pay for sod. Yes, pay for sod.
You cannot sacrifice safety or quality for speed

- Accelerated bridge deck riding surfaces. Is it worth getting a decrease in ride quality?
- Trying to work multiple crews in limited workspaces. Don’t believe the “project manager misnomer”: nine women together can make a baby in one month.
- At some point, men and machines only go so fast.
- Some things should be limited to emergency construction only.
Regulations and Rules
Don’t handcuff yourself intentionally

- The spec book is a guide in combination with common sense and design parameters.
- See the forest AND the trees. Look for opportunity, don’t be scared by the perception of “regulations and protocol.”
- Avoid the crutch of “Build it per plan.”
- Build flexibility into all aspects of your plan. Set the Engineer and contractor up for success later. You can always put in options, then not use them.
When is it time to rip the band-aid off?

- What do 9A-330P closure restriction really get the traveling public? How do we get anything done on the critical path in 5 ½ hours per shift?
- Twice the pain in less than half the time; the traveling public is equally unhappy.
- Understand fixed times (lane closure setups, equipment setups). Find ways to increase production times.
Partnering and Project Delivery
It takes effort and “want to”

- Empower personnel to make field level decisions.
- Stop with “We have #X days to review.” If it helps the project, walk it through and expedite. Take the active role.
- Don’t plan for IF something goes wrong, but rather WHEN something goes wrong.
- It may be a last minute idea, doesn’t mean it’s too late.
- Work towards helping the contractors be successful. This isn’t a puzzle.
- Neither side should have surprises waiting for them.
- “Bid as shown” before the letting – change order and delay after it.
Understand what tools you have in your toolbox

- Use of incentives and disincentives; it works better with more carrot and less stick.
- No excuse incentives – have your ducks in a row.
- Time determination calculations. Is the foundation you’re building on solid? What are we trying to accelerate? You can’t defy logic.
- Make a clean path for value engineering and time savings proposals. Discuss at the pre-con.
- Understand your bid items and the proper application of them.
Real world concerns

- Reduction of aesthetics, landscaping, form liner, bridge rail, etc.
- Prop 1/7 and the promise to the taxpayer. 80%+ of the voters didn’t support more funding for aesthetics. Even if third party pays – it still slows down the project.
- Understanding the workforce challenges and shortfalls, you’re not going to cut 50% out of project time in the current environment. One project gains – another project suffers.
- Accelerating time too much limits competition and success ratio.
- Accelerate key projects wisely. If you accelerate every project, you’ve accelerated none of them.
- Gains of 10-25% are realistic.
Project Delivery

- Project delivery task force goals are hand in hand with accelerated construction goals.
- High levels of open and productive communication.
- Setting realistic goals and expectations.
- All project team members have to be pulling the cart in the same direction.
Thanks

- TxDOT: Randy Hopmann, Tracy Cain, D/FW District Engineers, Area Engineers, and staff.
- TTI: Jon Epps
- AGC of Texas: Thomas Bohuslav
- Contracting community
District Workshops on Accelerated Construction
Regional Workshop Exercises
AC-PP-17-11
David Newcomb

Dallas/Fort Worth/Waco
Westin DFW
June 13, 2017
Typical Projects

A. Pavement Strengthening
B. Pavement Widening
C. Rural Intersection Reconstruction
D. Bridge Widening
E. Small Town Intersection
F. Suburban/Rural Widening
Project Details:

**Work**
- Project length: 3 miles
- 11” asphalt, mill 3”
- Replace with 4” AC or 6” PCC
- Shoulders to match
- Soil is expansive clay

**Traffic**
- AADT = 48,000
- Peak: M-F 6:30 am to 9:00 am and 4:00 pm to 6:30 pm
- Possible Detours: Frontage road, busy downtown on weekends, ramps @ 1 mile interval
Exercise B: Pavement Widening

Project Details:

Work
- Project length: 3 miles
- 11” concrete over 4” base
- Add 12’ lane + 4’ shldr to inside
- Alt: 8” AC/6” flex base or 8” JPCP/4” Type B
- New concrete median between directions
- Trucks not allowed on inside lane
- Soil is expansive clay

Traffic
- AADT = 50,000
- Peak: M-F 6:00 am to 8:30 am and 5:00 pm to 7:30 pm, wkend heavy not congested
- Possible Detours: Frontage road requires strengthening, ramps @ 1.5 mile interval
Exercise C: Rural Intersection Reconstruction

Project Details:

Work
Project: Shaded Area
Exist: 4” AC/6” Flex Base
Fix: 8” AC or PCC/remaining material
Soil is silty sand

Traffic
AADT = 20,000 for 4-lane; 5,000 for 2-lane
Peak: M-F 6:30 am to 7:30 am and 6:00 pm to 7:30 pm, wkend heavy traffic to recreational lake on 2-lane with increased turns
Possible Detours: Result in additional 15 miles
Project Details

First part of exercise focuses on widening existing bridge to add more lanes for increased capacity.

- **Setting** - Suburban area.
- **Existing bridge**
  - Medium-span lengths (80-120 ft).
  - Simply supported prestressed concrete I-girder construction. See figure for typical transverse section (girder type can vary).
  - Deck: reinforced concrete with precast concrete stay-in-place forms and an asphalt overlay.
- **Traffic** - AADT = 15,000 Peak is M-F, 6:30 - 7:30 am and 6:00 - 7:30 pm.

Discussion will be expanded to discuss alternatives and challenges for full replacement of short- and medium-span bridges.
Project Details:

Work

Project:
- 6’ Shldr. Widening
- 2” Overlay

Exist: 4” AC/6” Flex Base, No Curb/Gutter

Soil is Expansive Clay

Traffic

AADT = 5,000 for main road, 1,000 for crossroad
Peak: M-F 6:30 am to 7:30 am and 6:00 pm to 7:30 pm, wkend heavy traffic to recreational area

Possible Detours: Result in additional 20 blocks on side streets. Businesses on Main Street affected (20,000 sq. ft.)
Exercise F: Rural Road Widening

Project Details:

Work

Project:
FDR entire existing 24’ width
Add 6’ Shldr. Widening
Place 4” HMA surface
Length: 3 miles
Exist: 2” AC/8” Flex Base, No Curb/Gutter
Soil is Expansive Clay

Traffic

AADT = 5,000 for main road with 20 driveways
Peak: M-F 6:30 am to 7:30 am and 6:00 pm to 7:30 pm
Possible Detours: Result in additional 5 miles.
Items to Consider

- Key economic analysis factors
- ROW, utilities, environmental, historic preservation, archeology
- Public information
- Contracting methods
- Design
- Contractor selection
- Involvement of contractor
- Construction considerations
- Other
List Top 5 Challenges

1. 

2. 

3. 

4. 

5. 

[Image: Texas A&M Transportation Institute]
Suggested Time Utilization

- General project discussion – 15 min
- Items to consider – 15 min
- Top five challenges – 45 min
- Information needs – 15 min
Facilitator Report

- Briefly describe project
- Top 5 challenges
- Information needs
<table>
<thead>
<tr>
<th>Group</th>
<th>Facilitator</th>
<th>Reporter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Chad Dabbs</td>
<td>Brandon Sparkman</td>
</tr>
<tr>
<td>B1</td>
<td>Darwin Myers</td>
<td>Christian Mendoza</td>
</tr>
<tr>
<td>C</td>
<td>Jason Mashell</td>
<td>Solomon Thomas</td>
</tr>
<tr>
<td>D</td>
<td>Charles Smith</td>
<td>Brenan Honey</td>
</tr>
<tr>
<td>E</td>
<td>Jason Duncan</td>
<td>Jeff Bush</td>
</tr>
<tr>
<td>F</td>
<td>Korey Coburn</td>
<td>Justin Thomey</td>
</tr>
<tr>
<td>B2</td>
<td>Etienne Ecthovekang</td>
<td>Tina Massey</td>
</tr>
</tbody>
</table>
Group Meetings

1:00 – 2:30
District Workshops on Accelerated Construction

Dallas/Fort Worth/Waco
Westin DFW
June 13, 2017
2017 Unified Transportation Program (UTP)

2017–2026
Transportation Planning & Programming
We Build Texas

Field Guide to
Successful Project Delivery

We build Texas – Safely
We build Texas – Quality
We build Texas – On Time
We build Texas – Together

Working together to successfully deliver projects.

Texas Department of Transportation

ASSOCIATED GENERAL CONTRACTORS OF TEXAS
Interest in Construction

- Visibility to public
- Safety
- Economics
Acceleration Goals

NOT

\[ \text{Construction time} \]

\[ \text{reduction in time} \text{ to complete project} \]

WANT

\[ \text{Construction time} \]

\[ \text{reduction in time} \text{ to complete project} \]
Economic Consideration

- Direct project costs
  - Agency
  - Some contractor

- Indirect project costs (user/non-user)
  - User fuel/time
  - Roadside businesses
  - Business efficiency (timely delivery)
  - Some Contractor

All costs eventually borne by the public
## Project Delivery

<table>
<thead>
<tr>
<th>Planning &amp; Programming</th>
<th>Preliminary Design</th>
<th>Environmental</th>
<th>ROW Utilities</th>
<th>PS&amp;E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need</td>
<td>Design Concept</td>
<td>Preliminary</td>
<td>Data Collection</td>
<td>Design details</td>
</tr>
<tr>
<td>Scope</td>
<td>• Data Collection</td>
<td>• Interagency</td>
<td>• ROW map</td>
<td>• Final alignment &amp; profiles</td>
</tr>
<tr>
<td>Cost estimate</td>
<td>• Public meetings</td>
<td>• Documentation</td>
<td>• Appraisals</td>
<td>• Roadway</td>
</tr>
<tr>
<td>Authorization</td>
<td>• Schematics</td>
<td>• Public hearing</td>
<td>• Acquisition</td>
<td>• Operational</td>
</tr>
<tr>
<td>Planning</td>
<td>• Preliminary</td>
<td>• Clearances</td>
<td>• Utility adjustment</td>
<td>• Bridge</td>
</tr>
<tr>
<td>Funding</td>
<td>• Geometric</td>
<td></td>
<td></td>
<td>• Drainage</td>
</tr>
<tr>
<td></td>
<td>• Value Engineering</td>
<td></td>
<td></td>
<td>• Misc structures</td>
</tr>
</tbody>
</table>

- Time

**Letting**

**Construction**
Katy Freeway (IH-10)

- 23 miles
- 280,000 VPD
- $2.6 billion (2/3 construction)
- 6 years vs 12 years
Economic Incentives - Contractor

- One job/occasional job
- Return on investment (equipment)
- Bonding capacity
- Backlog of work
- Risk
Policies and Procedures

• Develop guidelines
• District support team
  • Bridges
  • Pavements
  • Construction planning
• Drainage
• Traffic
• Production rates
Involvement of Contractor

• Planning and design review
• Partnering
• Communication
• Workforce
### Development Needs

- Project selection
- Contracting methods
- Design guides
- Contractor selection
- Involvement of contractor
- Construction considerations
Development Needs

• Evaluation tools to allow use of existing materials
  • Condition of existing material
  • Recycling
• Traffic modeling
• Economic analysis
• Rapid QC/QA
• Removal & replacement of materials
• Equipment development
• Materials development
Not All Projects Are Suitable for Accelerated Construction
District Workshops on Accelerated Construction