Boosting CRAVE™ with the Power of VISSIM
2016 OTEC
Adam Lynch
October 26, 2016
Topics Covered

- Value Engineering (VE)
- Cost Risk Assessment (CRA)
- HDR’s CRAVE™
- Importance of Vissim
The Traditional Value Engineering (VE)

- Improves the Value
- Solution based
- More than Cutting Corners
The Traditional Value Engineering (VE)

- Value = Increase in Benefits-to-Cost Ratio

- Is that enough?
Traditional Cost-Risk Analysis (CRA)

- What could go wrong?
- How much could it cost
- What if this risk could be mitigated?
Shortfalls of **Independent** CRA and VE studies

- CRA – Loosing great ideas
- VE – Add more risk?
Introducing HDR’s CRAVE™

- CRAVE™ combines Cost Risk Analysis + Value Engineering in one coordinated workshop.

- Benefits:
  - Improves delivery;
  - Optimizes solutions
  - Mitigates quantified risks
Proven process

- Proven results on a wide range of projects, including:
  - Bridges
  - Highways
  - Heavy and light rail alignments
  - Ports
  - Airports
  - Tunnels
  - Water treatment facilities
  - Pipelines

Won national awards for process
Proven process (2 to 5 Days)

1. Get up to speed
2. ID Baseline Risk & Performance weights
3. Brainstorm Alts
4. Rank (Fatal Flaws)
5. Preferred VE Alt
6. Analyze
7. Final Score / Report
Risk Baseline
Contingency: Traditional vs. Risk-Based Approach

- Geotech: 20%
- Materials: 40%
- Environmental Requirements: 30%
- Design: 5%

Fixed Contingency %

Project Base Cost

Hone in Actual Risk-Based Contingency
Risk Assessment
Threat vs. Opportunity

**Threat** – Something that increases Risk

**Opportunity** – Something that decreases Risk
Risk Assessment

- Risk Severity and Occurrence

“How much would cost impact if ____ happens?”
# Brainstorming & Ranking

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<thead>
<tr>
<th>#</th>
<th>Description</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Move the eastbound off-ramp and westbound on-ramp at NC 42 to Cleveland School Road</td>
<td>• Reduces interchange conflicts points</td>
<td>• Creates a weaving movement on I-40 • Creates a circuitous movement for some of the traffic</td>
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<tr>
<th>Mainline Operations</th>
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<th>Maintainability</th>
<th>Construction Impacts</th>
<th>Environmental Impacts</th>
<th>Future Compatibility</th>
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Rating: 1

Justification/Comments/Disposition: Dropped from further consideration

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<tr>
<td>7</td>
<td>Add a flyover ramp from Cleveland School Road to I-40 west along with the previous idea</td>
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Rating: 0

Justification/Comments/Disposition: Fatally Flawed – beyond the scope of the project

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<td>1</td>
<td>Construct Cornwallis Road interchange instead of the DDI at NC 42 interchange</td>
<td>• Easier construction (lower traffic volumes) • Shorter construction duration • Will reduce network congestion more than just improvements at NC 42 • Will relieve traffic during construction if NC 42 is improved in the future • Allows for growth away from NC 42</td>
<td>• Increased cost • Collector roads to Cornwallis will need to be improved in the future • Environmental mitigation will be needed • Locals may not want an interchange at Cornwallis • Adding this project may delay design by 6-12 months • Increased impacts to right-of-way</td>
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Rating: 4

Justification/Comments/Disposition: Moved to further development
CRAVE™ on Transportation Projects

- Analysis depends heavily on traffic!

- Mainline Operations
- Local Operations
- Maintainability
- Construction Impacts
- Environmental Impacts
- Compatibility
Possible Transportation Projects Challenges

- Major urban projects
- DDI’s, roundabouts, SPUI’s, Managed Lanes
- Lots of weaving
- Highly congested corridors with strange lane utilization
- Complex intersections
- Long queuing
Using VISSIM with CRAVE™

Versatile

“Fast”

Perform System-wide Evaluations

Balance of Presentation & Results
Case Study: US 18 (Verona Rd), Madison, WI
Existing
Case Study: US 18 (Verona Rd), Madison, WI
Baseline Alternative

Grade Separated Interchange (10-Lane Structure)

Grade Separated Interchange (4-Lane Structure)

Traditional At-Grade Separated
Case Study: US 18 (Verona Rd), Madison, WI
Baseline Alternative

10-lanes!
Case Study: US 18 (Verona Rd), Madison, WI

Brainstorming

Typical “Texas-Style” Frontage Rd Ramp Concept
Case Study: US 18 (Verona Rd), Madison, WI

Brainstorming

Modified “Texas-Style” Ramp Concept
a.k.a “X-Ramp”
Case Study: US 18 (Verona Rd), Madison, WI
Preferred Alternative

DDI # 1

DDI # 2

Williamsburg Way

PD (McKee Rd)

Raymond Rd

At-Grade T Intersection
Case Study: US 18 (Verona Rd), Madison, WI
Modeling Process

- Synchro Import
  - Basic geometry
  - Signals

- Calculated Routing decisions for whole corridor

- MOEs for Baseline alt in VISSIM

- Coded CRAVE Preferred Alt
  - DDI Interchanges
  - Frontage Rd
  - Raymond Rd

- Apples to Apples Comparison
  - Still Conceptual Study
  - Minimal Calibration needed
Case Study: US 18 (Verona Rd), Madison, WI

Results

- Increased Benefit-Cost Ratio

- Reduced project Cost!
  - $14 million dollars

- Success!
Case Study: US 18
(Verona Rd), Madison, WI

Vissim Model
QUESTIONS?