SMART SCALE & Performance Based Planning

Land Use Forum - May 2018
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SMART SCALE Program Manager
Office of Intermodal Planning and Investment

Funding the Right Transportation Projects in Virginia
Overview

- Performance based programming
  - SMART SCALE
  - SGR
  - HSIP

- Performance Based Planning/Project Development
  - Philosophy
  - Rethinking how to solve transportation problems

Success here depends on...

Effort here.
Performance Based Programming

- Performance measures are driving the project selection and funding allocation processes
  - SMART SCALE
  - SGR
  - HSIP
- Scoring and selection based on metrics (e.g. asset condition) and assessing expected benefits (e.g. reduction in crashes, repair vs replace $, reduction in delay, etc)
- Project cost is important variable
Needs → Solutions

- Where do the projects that get evaluated in the performance based programming process come from?
- Shouldn’t the process of developing and planning the solution be performance driven - to improve success in getting project funded?
- How can we feed better, more cost effective solutions into the project evaluation process?
- Are there existing projects that need to be re-examined or re-scoped?
Performance Based Planning/Project Development
Rethinking the Solutions
Performance Based Planning

● If it ain't broke don't fix it… establish a need/problem
● If you can, prevent breakage from occurring… preserve/protect assets
● If it's broke, can you fix what you have…
  ○ Operational improvements
  ○ Innovative intersection treatments
  ○ Travel Demand Management
● If you have exhausted all options to improve what you have, then consider a new one (build more)
Performance Based Planning

Does this decision tree make sense?

New Engine

New Car
Performance Based Planning

Or is this more logical...

Understand the problem

Develop/Test Solutions
Rethinking how we solve transportation problems

- SMART SCALE
- STARS
- Arterial Preservation and Innovative Intersections
- Common Sense Engineering

Common Thread
Focused Cost Effective Solutions
Scenario Comparison
Objective: Reduce congestion and improve safety along corridor with 10 signalized intersections

**Strategy 1**
Widen corridor by one lane in each direction for $90,000,000

**Strategy 2**
Convert corridor to Superstreet and install adaptive signal controllers and transit signal priority for $30,000,000
Transportation as a System

Peak hour queuing

Grade separate for $80M

Bottleneck transfers to next signal
Transportation as a System

Innovative intersection treatments at all 4 signals to improve throughput and reduce conflict points - $3-$5M per intersection

Improved performance along entire corridor - savings can be used to solve problems on other corridors
Rethinking Solutions

Expanding the Toolbox of Solutions

Current Toolbox

- Traffic Signalization
- Major Capacity increase if existing facilities
- New facilities

If all you have is a hammer, everything looks like a nail

~ Law of the instrument
Rethinking Solutions

Expanding the Toolbox of Solutions

- Access Management/Signal Reduction
  - Improve safety
  - Improve traffic flow
- New Technologies
  - Adaptive controllers
- Travel Demand Management
- Innovative Intersections
  - Improve capacity
  - Improve safety
Rethinking Solutions

Innovative Intersection Toolbox

Divergent Diamond

Displaced Left Turn Intersection

Quadrant Roadway Intersection
Reducing Conflict Points and Signal Phases

Benefits of Alternative Intersections

- **Safety**
  - Fewer conflict points
  - Significant before/after crash reductions

- **Mobility**
  - Reduced delay
  - Reduced congestion

- **Value**
  - Less right-of-way needed
  - Lower construction costs
  - Quicker project delivery
Urban Application
US 281 in San Antonio, TX

53% decrease in travel time

Loons to facilitate U-turns
Rural Application
US 17 in Leland, NC

55% decrease in Fatal and Injury crashes

RCUTs can be implemented without signals
I know what you are thinking...

HERE WE GO AGAIN
I know what you are thinking...

- “Innovative intersections aren’t pixie dust that can solve every problem - to think otherwise is a fairytale.”
- “Sometimes common sense means spending some stinking money on a big solution to a big problem.”

How many of you have felt this way?
If you raised your hand...

- You are 100% correct
- Specific treatments or engineering solutions are not by themself innovative - application in the wrong situation = bad outcome = bad solution
- Innovation is the result of a process, a way of working and thinking
- Doing the same thing over and over because “that’s the way it is done” <> innovation
- Doing something different just to be different <> innovation
- Innovation rarely comes out of ample time and resources - it comes out of necessity or is a conscious deliberate effort
Necessity → Innovation
Warrenton Southern Interchange

Necessary innovation

Case Study

- Initial project:
  - Full interchange
  - >$45M estimate
- Significant Bridge Costs (5 Lane)
- Significant Width Ramps to accommodate volumes
- Top priority for the Culpeper District
- Project selected in Round 1
- Non-engineer estimate reduced to $27M
- District was directed to make it work
Warrenton Southern Interchange
Barbell Design Option

Case Study

Necessity led to innovation

- Project team sharpened pencils
- Roundabout terminals reduced bridge to 2 lanes, reduced grading for ramps and provided:
  - better long term level-of-service
  - improved safety and reduced maintenance costs - less pavement, no signals, smaller deck
- Final design-build proposal being awarded to Shirley-Dewberry for $19.8 million
- CEI and overhead likely add $3-5M
- $47M → $27M → $23-25M
US 360, Chesterfield County - Superstreet

Examples in Planning Stage

Improvement 7 – Construct Five Superstreet Intersections along US 360 Corridor

82% reduction in travel time

US 360/RUTHE 288 INTERCHANGE AREA STUDY

Virginia Department of Transportation
Examples in Planning Stage

Route 234, Prince William County

Almost 40% reduction in cost over grade separation
70-80% reduction in delay
NB vs B

Project Description
This project improves operations on Prince William Parkway at Sudley Manor Drive and Wellington Road by converting the intersection of Prince William Parkway and Sudley Manor Drive to a full continuous-flow intersection and constructing a bridge to grade separate Prince William Parkway and Wellington Road. At the continuous-flow intersection, all left-turn movements cross to the opposite side of the street at a signalized crossover before reaching the main intersection, allowing protected left turns and opposing through movements to occur simultaneously at the main intersection. The new bridge eliminates delay on Prince William Parkway and Wellington Road. The eliminated turning movements between Prince William Parkway and Wellington Road can be accommodated by the Sudley Manor Drive/Prince William Parkway intersection.

Planning Level Cost Estimate

<table>
<thead>
<tr>
<th>Phase</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Engineering</td>
<td>$8,121,000</td>
</tr>
<tr>
<td>ROW and Utility Relocation</td>
<td>$12,719,000</td>
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<tr>
<td>Construction</td>
<td>$39,213,000</td>
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<tr>
<td><strong>Total Cost</strong></td>
<td><strong>$80,053,000</strong></td>
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Note: Cost estimates reported in 2017 dollars

Project Schedule

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<tr>
<th>Months</th>
<th>0</th>
<th>12</th>
<th>24</th>
<th>36</th>
<th>48</th>
<th>60</th>
<th>72</th>
<th>84</th>
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</tbody>
</table>

Project Benefits

Traffic Operations Benefits

<table>
<thead>
<tr>
<th>Peak Hour</th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Build</td>
<td>128.6 sec/veh</td>
<td>192.5 sec/veh</td>
</tr>
<tr>
<td>Build</td>
<td>130.0 sec/veh</td>
<td>202.2 sec/veh</td>
</tr>
<tr>
<td>Delay</td>
<td>-97.7 sec/veh</td>
<td>-154.2 sec/veh</td>
</tr>
</tbody>
</table>

Safety Benefits

Reduces conflict points at the continuous-flow intersection
Grade separation removes all crossing conflict points
Increases share of mainline green time, which results in reduced delay/stops and potentially mitigates rear-end crashes
Examples in Planning Stage

Route 234, Prince William County

PRINCE WILLIAM PARKWAY AND CLOVER HILL ROAD
PREFERRED ALTERNATIVE: BOWTIE INTERSECTION

Project Description
This project improves operations on Prince William Parkway at Clover Hill Road by converting the existing conventional intersection to a bowtie intersection. Left turns are not permitted at the main intersection and vehicles must turn right or continue straight and use downstream roundabouts to complete left-turn movements. Removing left turns from the main intersection allows the intersection to operate under two-phase signal control, which increases green time on Prince William Parkway by 50% and reduces delay for mainline through vehicles as well as the overall intersection. The roundabouts are designed to accommodate large trucks and are spaced to provide appropriate queue storage.

Planning Level Cost Estimate

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</tr>
<tr>
<td>ROW and Utility Relocation</td>
<td>$140,000</td>
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<tr>
<td>Construction</td>
<td>$11,096,000</td>
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<tr>
<td><strong>Total Cost</strong></td>
<td><strong>$14,363,000</strong></td>
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Note: Cost estimates reported in 2017 dollars

Project Benefits
Traffic Operations Benefits

<table>
<thead>
<tr>
<th>AM Peak</th>
<th>PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delays</td>
<td>Delays</td>
</tr>
<tr>
<td>2040 No Build 49.6 sec/veh</td>
<td>69.3 sec/veh</td>
</tr>
<tr>
<td>2040 Build 33.7 sec/veh</td>
<td>43.2 sec/veh</td>
</tr>
<tr>
<td><strong>Delays</strong> 35.9 sec/veh</td>
<td>26.1 sec/veh</td>
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<tr>
<td><strong>Prince William Parkway Through Delays</strong> 30.1 sec/veh</td>
<td>59.6 sec/veh</td>
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</tbody>
</table>

Note: Prince William Parkway through delay reported for peak direction

Safety Benefits
- Reduces conflict points at the intersection
- Removes left-turn movements across high-speed mainline corridor
- Increases share of mainline green time, which results in reduced delays and stops and potentially mitigates rear-end crashes

PRINCE WILLIAM PARKWAY INTERSECTION ALTERNATIVES STUDY
Project Applications
Success in Leveraging the Expanded Toolbox

• **Adaptive Signal Control**
  • US 220 – Roanoke / Roanoke County (Funded HB2 FY17)
  • Norfolk (Funded HB2 FY17)
  • Alexandria (Funded HB2 FY17 and SMART SCALE FY18)
  • Route 419 and Route 221 – Roanoke County (Funded SMART SCALE FY18)
  • Winchester (Submitted Revenue Sharing FY18)
  • Graves Mill Road – Lynchburg (Submitted HSIP FY19)

• **Innovative Intersections**
  • Route 10 Signalized RCUT – Chesterfield County (Funded HB2 FY17)
  • North Main RCUT – Blacksburg (Funded HB2 FY17)
  • US 13 RCUT – Accomack County (Submitted HSIP FY19)
  • US 220 Continuous Green-T – Franklin County (Submitted Revenue Sharing FY18)
Innovation by choice... by default

- Approach every transportation problem as a personal challenge to find the most cost-effective solution to the identified problem(s)
- Commonwealth cannot submit projects for SMART SCALE
- Easy for local/regional decision makers or public to see innovation as:
  - Settling for a less than optimal project
  - Getting less for less
  - Bubblegum, Baling Wire, and Band-aids

Translation → For innovative solutions to be submitted and funded, VDOT and DRPT must engage and educate decision makers and the public
Resources

- SMART SCALE website - http://smartscale.org
- SMART Portal - https://smartportal.virginiahb2.org
- VTrans - www.vtrans.org
- STARS mapping - https://app.box.com/v/VDOTSTARS
  ○ Includes layers for congestion, safety reliability, etc
- Innovative Intersections - www.virginiadot.org/innovativeintersections
- Warrenton interchange - Culpeper District points of contact
  ○ Hal Jones, Nathan Umberger, or Will Stowe