

Maryland State Highway Administration (SHA)



SHA's New Tool for Calculating Road User Cost

Presented by: Matt Snare, P.E., PTOE
ITE 2009 District 2 Annual Meeting
May 1, 2009

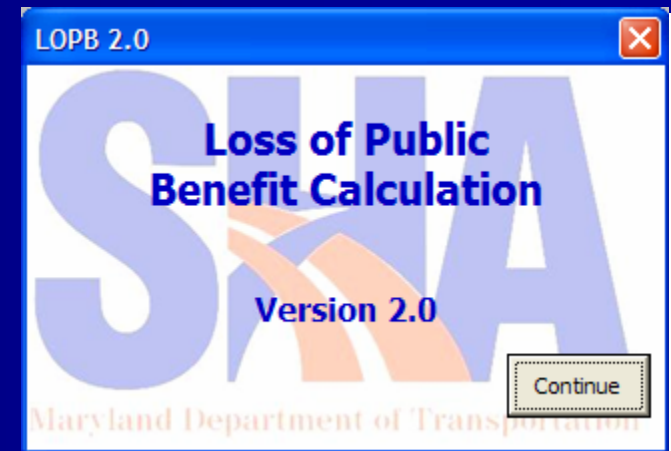
About the Presenter

- Matt Snare, P.E., PTOE
- Project Engineer – Traffic
 - RK&K Engineers
- On-Site Support
 - SHA Travel Forecasting & Analysis Division
- Contact Info
 - msnare@rkk.com
 - (410) 462-9152



Introduction

- SHA has developed a new methodology and software tool for calculating road user costs
- Presentation Outline
 - Define User Cost
 - Need for Updated Methodology
 - Describe User Cost Components / Calculations
 - Program Demo



What is User Cost?

- The costs of travel incurred by road users
- Three primary components
 - Value of Travel Time
 - Vehicle Operating Costs
 - Fuel Costs
 - Wear and Tear
 - Crash Costs



What are some uses of User Cost?

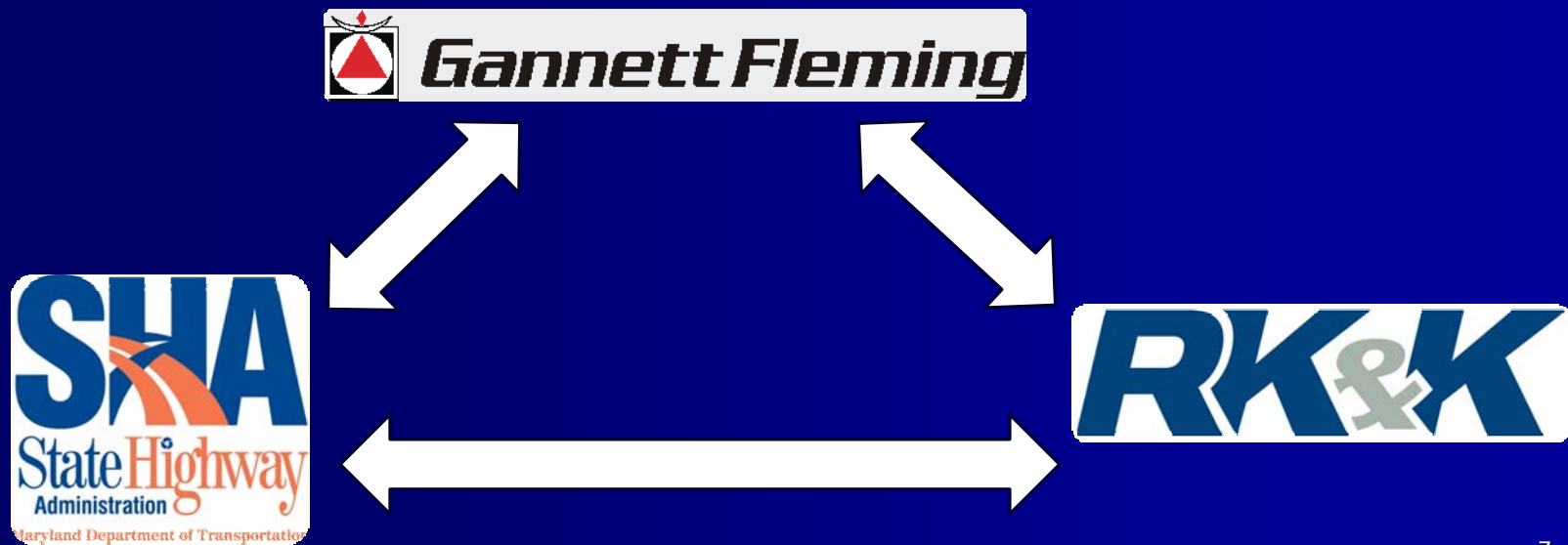
- Determine “Loss of Public Benefit” for construction projects involving significant MOT
 - Contractor Incentive / Disincentive Clause
- Determine Project Cost/Benefit
- Determine Lane Closure Fees
- Maintenance of Traffic Alternatives Analysis
- A + B Bidding

Why update the methodology?

- SHA's previous methodology
 - Used old data
 - Undocumented assumptions
 - Inconsistent results between preparers
 - Low calculated user cost values
- Goals of new methodology
 - Recent, local, reliable data
 - Defendable results
 - Shorter computation times (increased efficiency)

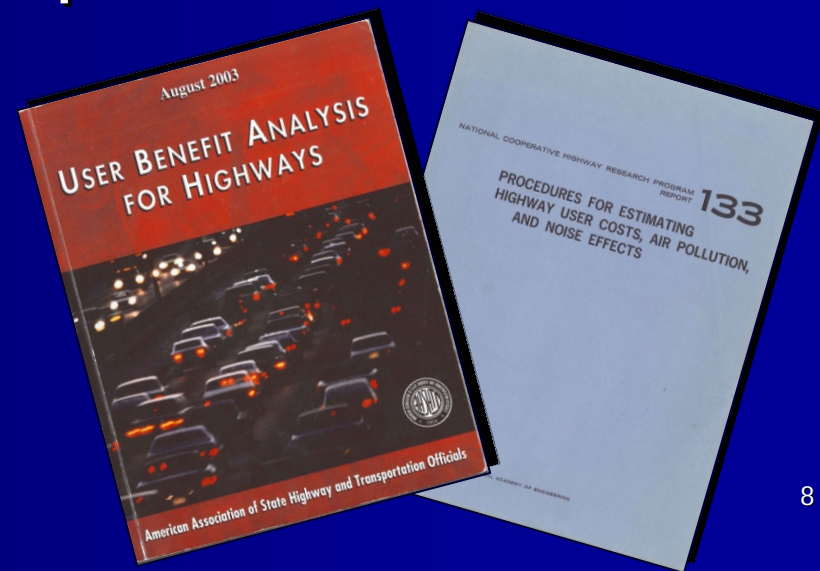
Program Development

- Collaborative effort between SHA Travel Forecasting & Analysis Division, Gannett Fleming, and RK&K Engineers, with input from SHA Office of Traffic and Safety



Research Efforts

- Examined methodologies used in ten other states
 - CO, DE, MI, NC, NJ, NY, PA, VA, VT, WV
- Reviewed national publications
 - AASHTO Red Book
 - NCHRP Report 133
- Determined “best practices”



Three Components of User Cost

- Delay Costs
- Operating Costs
- Crash Costs

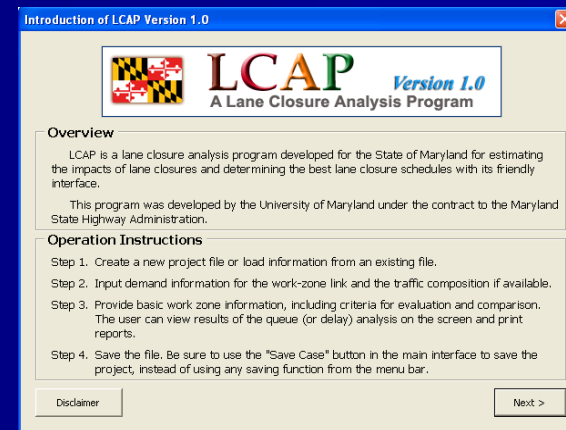
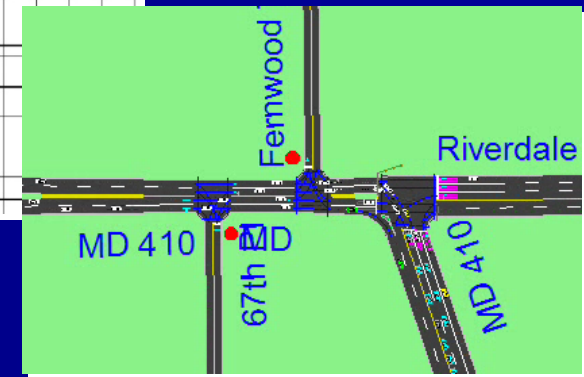
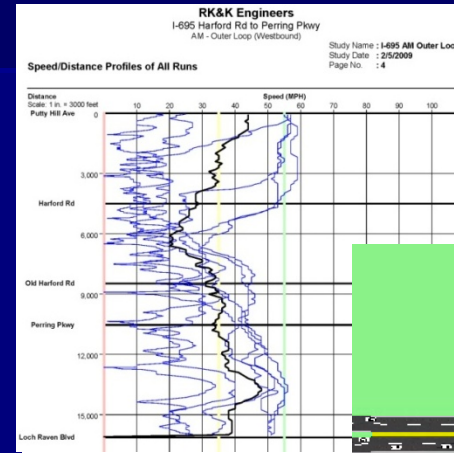


Delay Costs

- Value of Time formula - AASHTO Red Book
 - Autos: $50\% * \text{wage rate} * \text{vehicle occupancy}$
 - Trucks: $100\% * \text{compensation} * \text{truck occupancy}$
- Uses data from Maryland
 - 2005 average wage rates (updated periodically)
 - Factored to present using CPI
 - Vehicle occupancy from National Household Travel Survey
- Current values of time:
 - Autos: \$17.44 per hour
 - Trucks: \$28.61 per hour

Delay Calculations

- Detour Route
 - Segment Analysis
 - Travel Time Runs
 - Simulation Model
- Lane Closure
 - Lane Closure Analysis Program (LCAP)
 - Accounts for queue buildup and dissipation
- Multiply value of time by average vehicle delay to determine delay costs



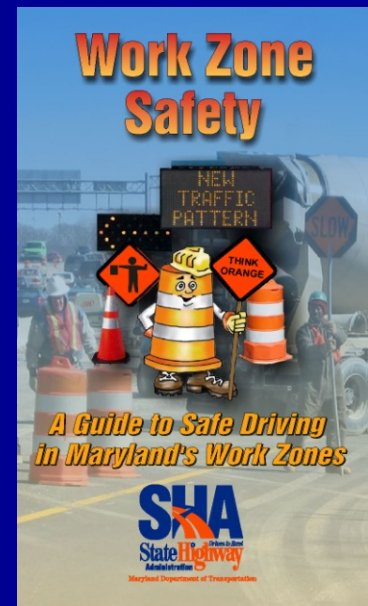
Operating Costs

- Extra Distance Cost
 - Use current IRS reimbursement rate (\$0.55 per mile)
 - Apply to extra distance traveled along detour routes
- Stopping Costs
 - Costs incurred for extra stops / starts
 - Already factored into IRS rate for autos
 - Added for trucks
- Idling Costs
 - 1970 values from NCHRP Report 133
 - Factored to present using CPI
 - Costs incurred while sitting in the queue



Crash Costs

- Previous methodology included “Accident Costs” for work zones with a lane closure
- Decision to NOT include crash costs in new methodology
 - Difficult to quantify crash reduction factors with available data
 - Not used in most other states
 - Excluding crash costs results in more conservative, defensible user cost value
 - SHA position that work zones are designed to be safe



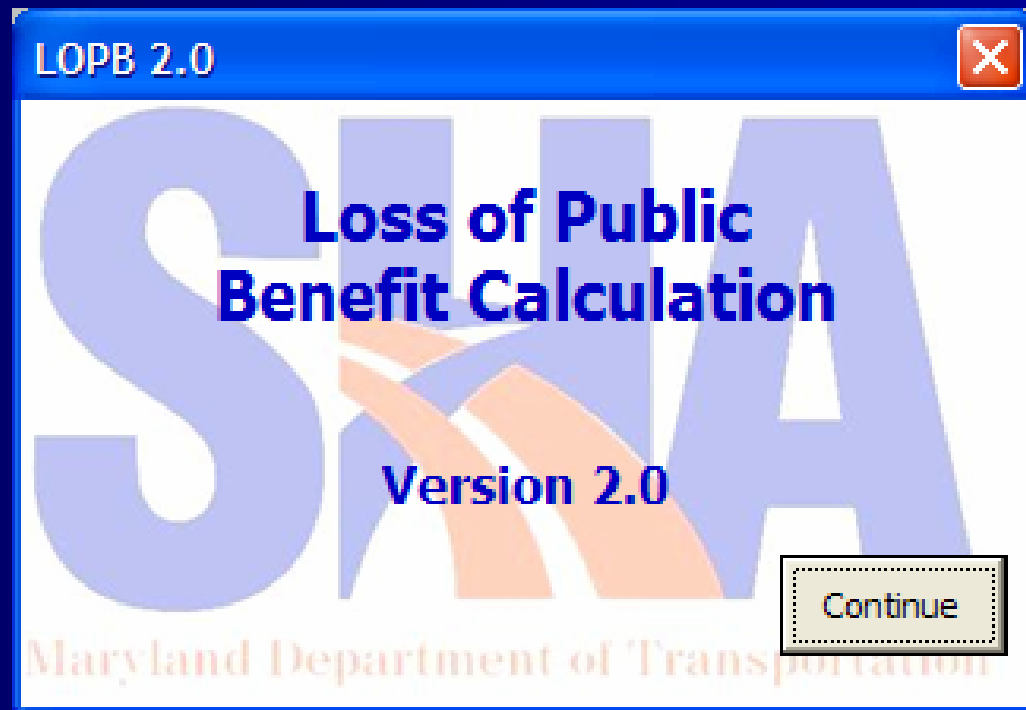
Loss of Public Benefit Software Tool

- Microsoft Excel program using Macros
- Simple and user-friendly
- Different modules for different MOT types
 - Module 1: Full Closure with Detour
 - Module 2: Lane Closure on Freeway / Expressway
- Inputs – ADT, Truck %, CPI, Network characteristics
- Output – Daily User Cost value

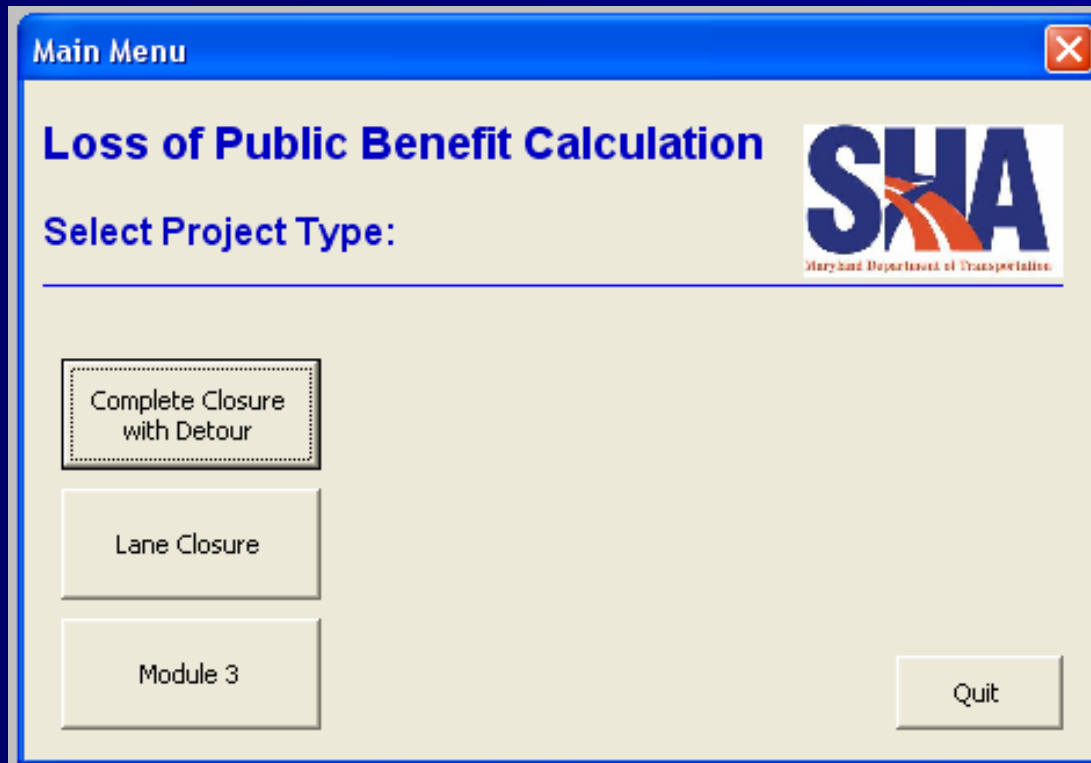
Loss of Public Benefit Software Tool

- LOPB tool specifically used to determine contract values for incentive / disincentive
- Other Uses
 - Select preferred MOT
 - Lane rental costs
- Project Status – Awaiting final approval
- Future modules planned
 - Temporary signal
 - Flagging operation

Software Demo



Software Demo



Software Demo

LOPB 2.0 - MD 362 Test_SampleDetour.lpb

File Tools Help

Full-Time Closure with Detour

Project Information Cost Information Route Information Summary

Description	MD 362 Bridge Closure with Detour
Analyst	Sample
Date	8/25/2008
Construction Year	2009
Projected ADT	1800
Truck Percentage	8

Software Demo

LOPB 2.0 - MD 362 Test_SampleDetour.lpb

File Tools Help

Full-Time Closure with Detour

Project Information Cost Information Route Information Summary

Current IRS Standard Mileage Rate	<input type="text" value="0.55"/>
Click link for current IRS Rates:	
	http://www.irs.gov
Current CPI-U, All Items	<input type="text" value="219.964"/>
Current CPI-U, Transportation	<input type="text" value="212.806"/>
Click link for current CPI values:	
	http://www.stats.bls.gov/news.release/cpi.t01.htm

Software Demo

LOPB 2.0 - MD 362 Test_SampleDetour.lpb

File Tools Help

Full-Time Closure with Detour

Project Information Cost Information Route Information Summary

Travel Time Computation Method

Travel Time Runs Segment Analysis Simulation Model

Segment Analysis Details

	Closure	Detour	
Total length	5.08	9.18	mi
Total signals	0	0	
Number of thru signals	0	0	
Total turns	0	2	
	Segments	Segments	
Average Signal Delay (secs)	15	Default Value	

Travel Time/Model Details

	Closure	Detour	
Length			mi
Total turns	0	2	
Off peak travel time			min
AM peak travel time			min
PM peak travel time			min

Software Demo

LOPB 2.0 - MD 362 Test_SampleDetour.lpb

File Tools Help

Full-Time Closure with Detour

Project Information Cost Information Route Information Summary

Construction Year ADT	1,800
Truck Percentage	8
Detour extra distance (mi)	4.10
Total Delay Cost (\$)	\$4,687
Total Operating Cost (\$)	\$4,196
Total Loss of Public Benefit (\$)	\$8,900

Detailed Report

Loss of Public Benefit Calculation Tool, Version 2.0 Results Summary

Project Description: MD 362 Bridge Closure with Detour Analyst: Sample
 Project Type: Road Closure with Detour Date: 8/25/08
 Construction Year: 2009
 Filepath: K:\projects\102-021\17\New LOPBWithVersionControl\MD 362 Test_SampleDetour.lpb

Traffic Volume Data

Construction Year ADT:
 Truck Percentage: %

Base Unit Costs

Delay Cost - Auto: per hour *(Factored to present from 2005 value of \$16 per hour)*
 Delay Cost - Truck: per hour *(Factored to present from 2005 value of \$26.25 per hour)*

Operating Cost - Auto: per mile, plus per hour idling
 Operating Cost - Truck: per mile, plus per hour idling, plus per stop

Travel Time Computation Method:

Route Information

	Length	total # of signals	# of thru signals	# of turns	Travel Time
Original Route	5.08	0	0	0	0.127
Detour Route	9.18	0	0	2	0.264
Net Increase	4.1				0.137 hours

Signal Delay 15 seconds/intersection

Delay Cost Calculations

Delay Cost - Auto: # of autos * increased travel time * value of time
 Delay Cost - Truck: # of trucks * increased travel time * value of time
 Total Delay Cost: Auto delay cost + truck delay cost

Operating Cost Calculations

Idling Cost: N/A for full closure with detour
 Operating Cost - Auto: # of autos * increased distance * operating cost per mile
 Operating Cost - Truck: # of trucks * increased distance * operating cost per mile
 + # of trucks * average additional stops * cost per stop
 Total Operating Cost: Auto operating cost + truck operating cost

Total Daily Loss of Public Benefit

Loss of Public Benefit Total Delay Cost + Total Operating Cost

(rounded to nearest \$100)

Questions / Comments