January 2015 **FHWA-NJ-2014-015**

New Jersey Department of Transportation
Bureau of Research

Technical Brief

Study of Public Perception of Traffic Congestion in New Jersey

The objective of this research project was to enhance the capabilities of the Congestion Analysis Model currently used by the NJDOT Bureau of Commuter & Mobility Strategies. The enhancements included development of a corridor-level congestion analysis and updated methodology for calculating congestion performance measures in support of the NJDOT asset management goals and analysis framework.

Background

In order to quantify traffic congestion and its impacts on New Jersey's motorists, New Jersey Institute of Technology (NJIT) developed the New Jersey Congestion Analysis Model (NJCAM), a computer software tool that estimates congestion costs, travel delay, and mobility indicators for New Jersey highways. NJDOT Bureau of Commuter & Mobility Strategies has been using the NJCAM in conjunction with the NJCMS to estimate annual costs of congestion on New Jersey highways resulting from recurring and non-recurring delays. However, since the NJCAM was first introduced the Department and the Bureau of Commuter & Mobility Strategies have increasingly been focusing on identifying problem areas and analyzing potential congestion mitigation measures on a corridor level, so as to maximize the benefits of capital investments and support smart asset management strategies. In this context it was desirable to enhance the NJCAM software tool to enable calculation of congestion related costs, as well as monetary benefits of potential improvements in specified highway corridors.

Research Objectives and Approach

The objectives of this research project included the following:

a) update the calculation methodology in NJCAM to better reflect the adopted criteria for evaluating congestion on New Jersey roadways;
b) enhance the existing and add new reports to meet the evolving needs of the congestion evaluation and analytics (e.g. user-defined corridor reports and a statewide one-page summary);

c) enhance user interface to provide for easier and more intuitive on-screen navigation; and
d) address the NJCAM software compatibility issues, streamline the software development platform, improve the work flow.

Summary of Software Revisions and Improvements

The calculation methodology was modified or re-defined for the following measures:

- Vehicle recurring delay;
- Vehicle non-recurring delay;
- Person-hours of delay (recurring and non-recurring);
- Fuel consumption and cost of wasted fuel;
- Travel Time Index (TTI) (new performance measure);
- Unproductive time for the traveling public; and
- Cost of congestion for trucks.

In response to the feedback from NJDOT users of NJCAM, the user interface was redesigned to enable more user-friendly data-entry and importing of data-tables from the New Jersey Congestion Management System (NJCMS). The new interface also gives users more flexibility with specifying the values of analysis parameters and the types of reports to be generated. Sample screens of the new, improved user interface are shown in Figures 1-4 on the next page.

The process flow in the application has been revised to streamline the analysis and reporting functions. In particular, the calculation procedure has been separated from the output aggregation procedure and reporting function. This change allows users to generate different levels of reports without repeating the calculations.

Modifications of the calculation methodology and inclusion of additional NJCMS tables in the congestion analysis model database increased the complexity of the data flow and the application itself. The revised process flow accommodates these revisions, improves users' flexibility in interacting with the model, and eliminates unnecessary or redundant steps in the analysis.

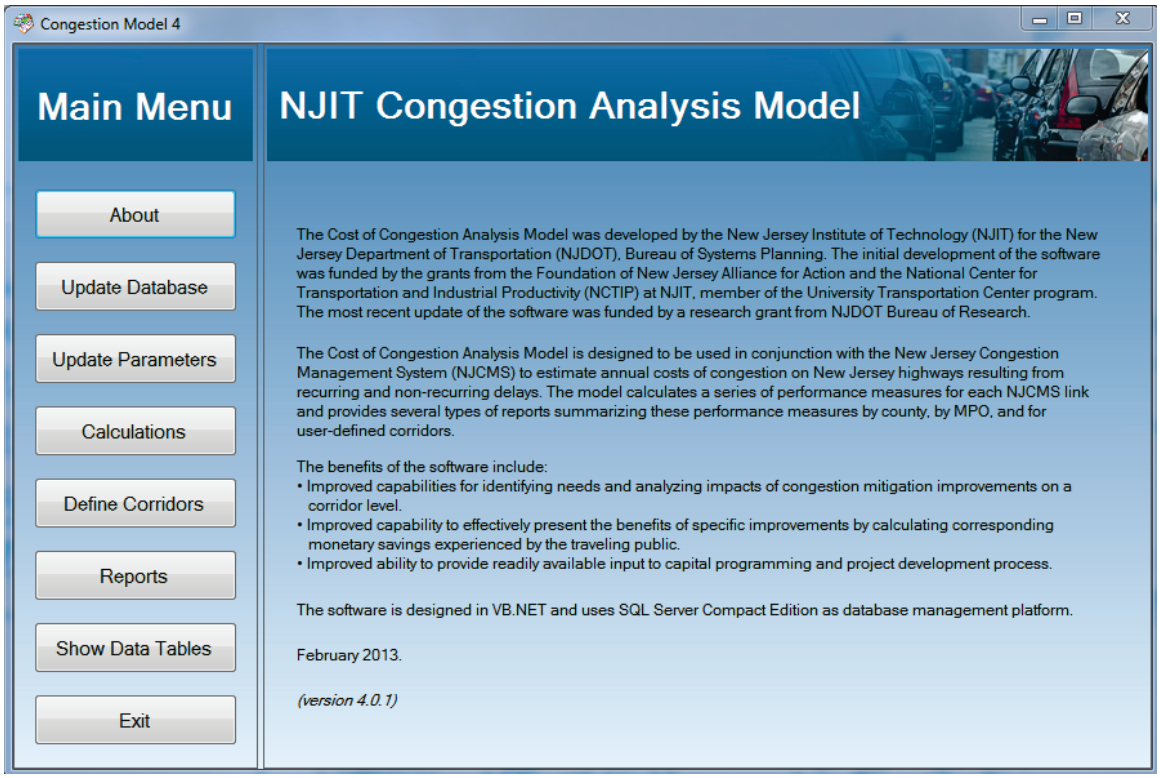

Figure 1: Main screen of the NJIT Congestion Analysis Model

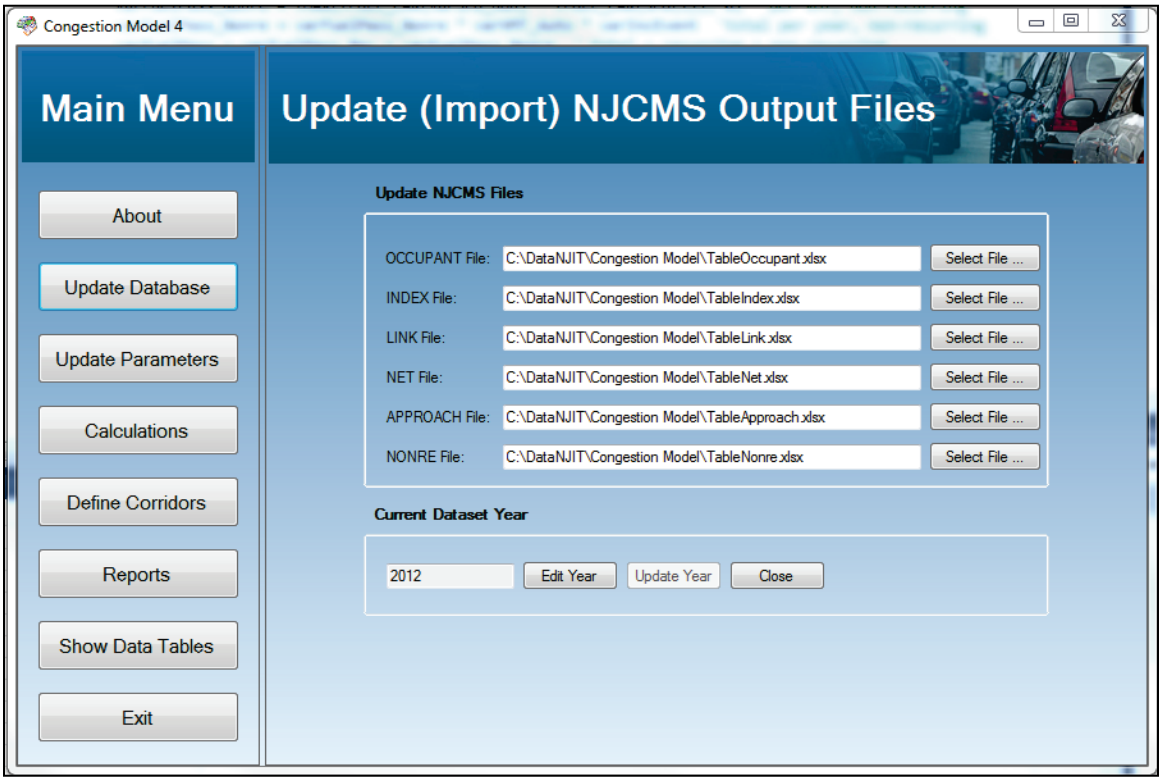

Figure 2: Roadway network database update screen

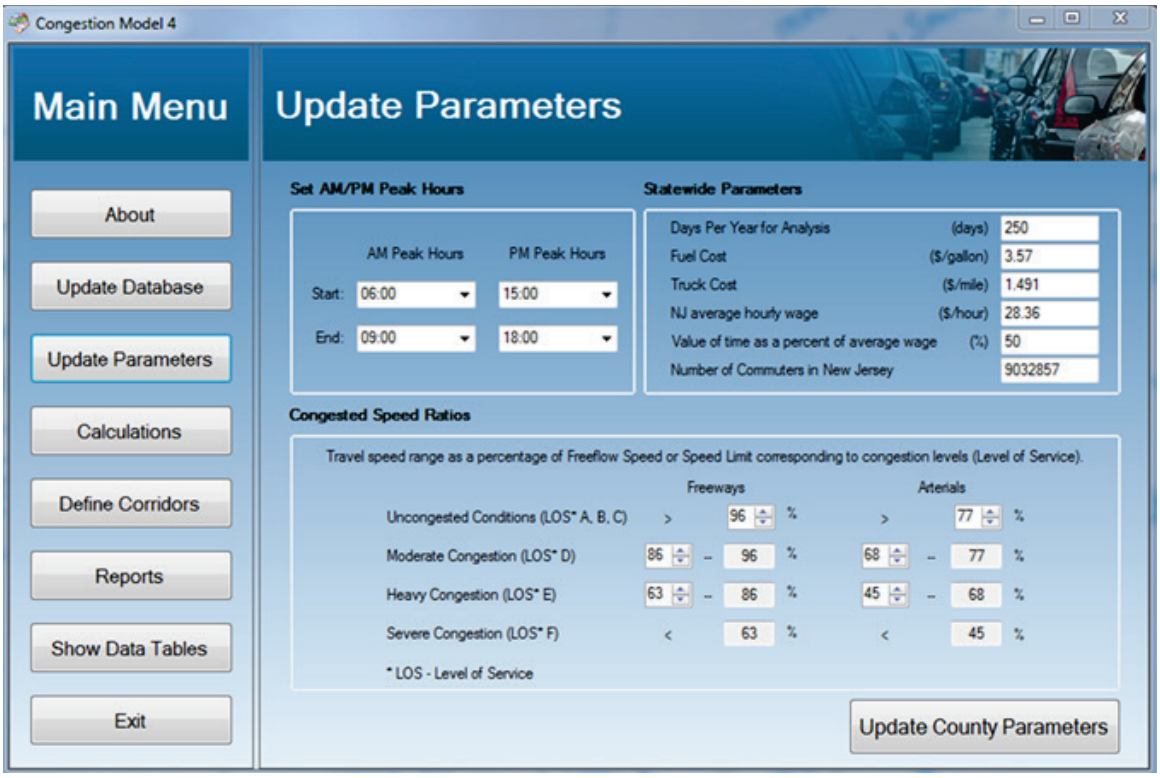

Figure 3: Parameters and analysis settings update screen

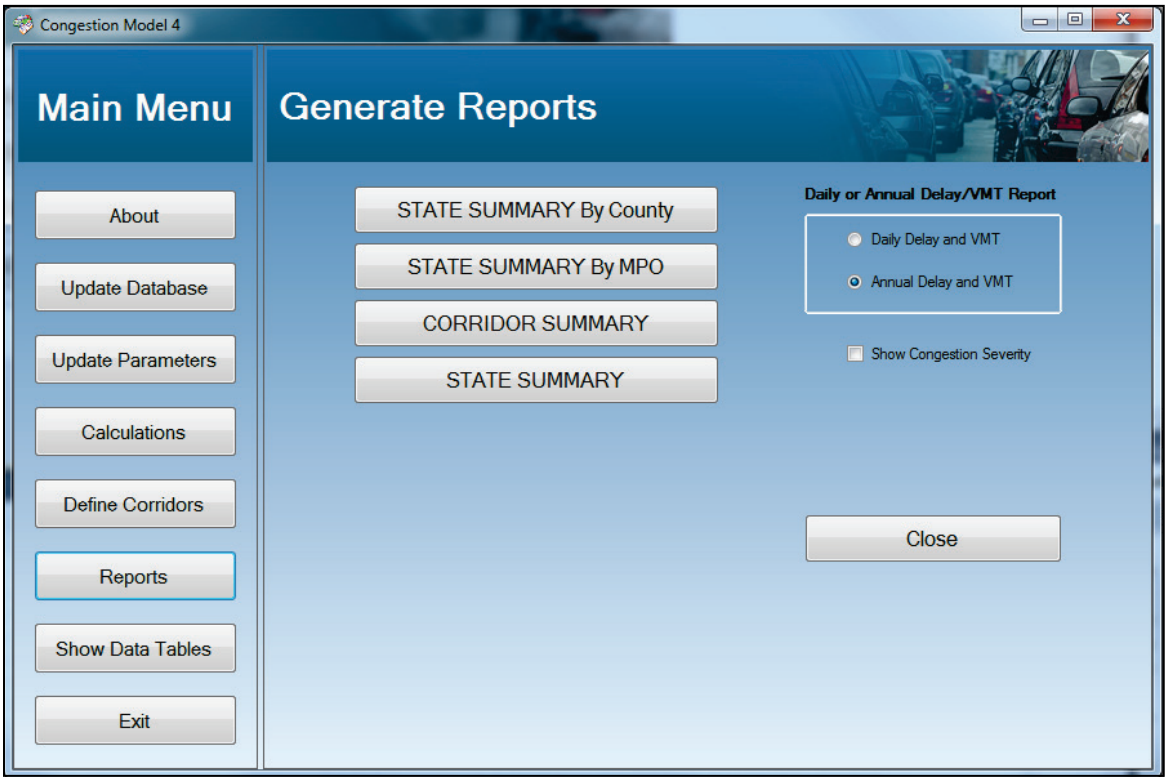

Figure 4: Report selection screen

The reporting function of the NJCAM has been completely redesigned. The new report format, exported into Excel spreadsheets, provides a more detailed and more readable breakdown of congestion measures. In addition, summary charts are provided in an MS Excel output file (see Figure 5). New reporting options include the corridor analysis summary report and the statewide summary ("one-page") report. Both reports are generated in MS Excel. A sample corridor analysis summary report is shown in Figure 6.

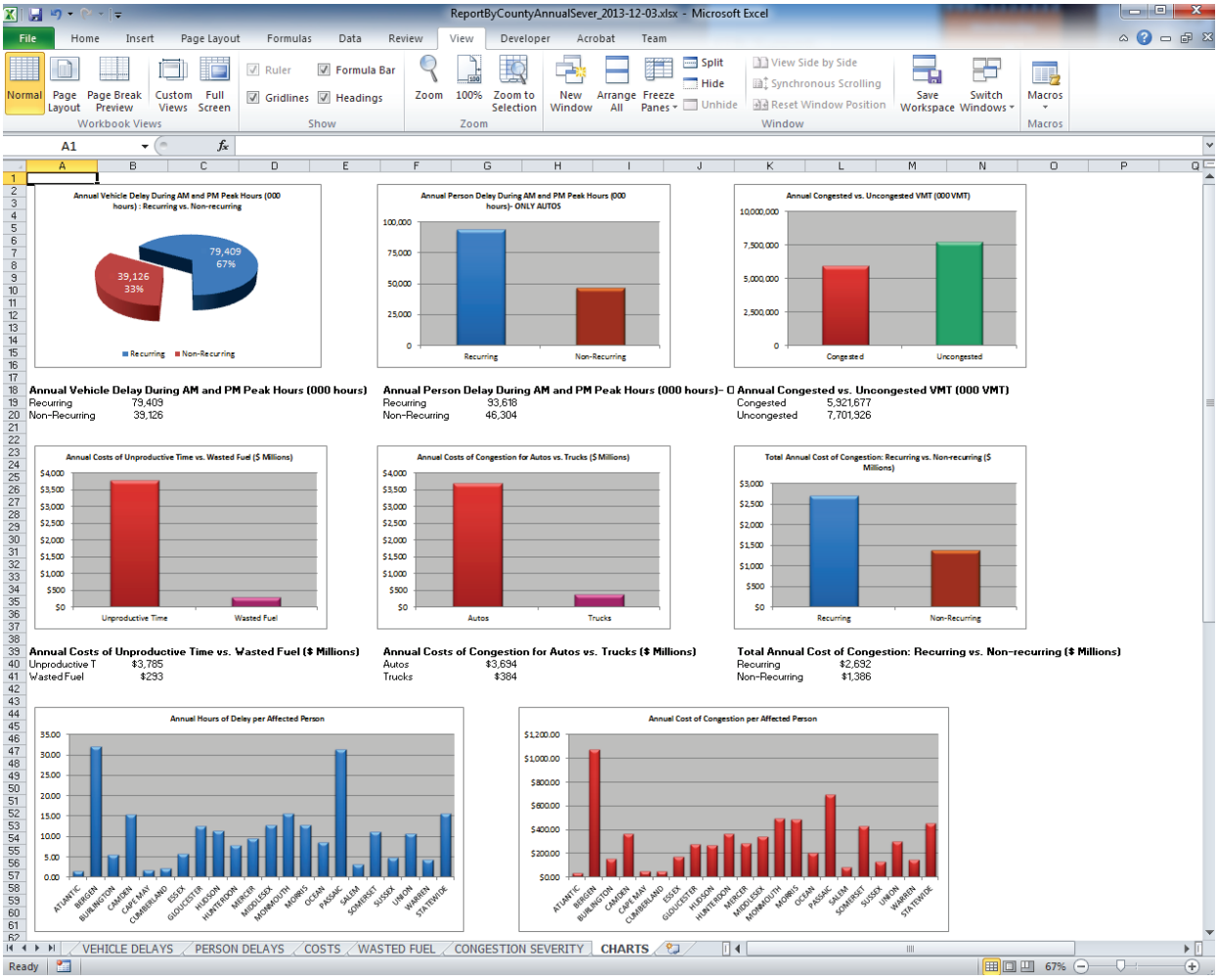

Figure 5: Summary report charts are provided in an MS Excel output file

Cost of Congestion Report for Corridor - NJ 4

Route	Begin MP	End MP	County
N. J. 4	0.00	0.13	Passaic
N. J. 4	0.13	10.83	Bergen

Vehicle Miles Traveled (thousands)	
Total Annual 24 Hr VMT	260,480
Annual AM Peak VMT	50,964
Annual PM Peak VMT	56,420

	RCI[1]	TRI[2]	TTI[3]
AM	0.40	3.22	4.36
PM	0.44	2.99	4.83

Annual Costs($) and Delay (Hrs) per Commuter	
Cost of Congestion	2,200.58
Cost of Wasted Fuel	210.06
Hours of Delay	122.80
Corridor Commuters	74,000

Person Delay (thousand Hrs)	
Total Person Delay	9,087.26
Recurring Delay	5,321.08
Non-Recurring Delay	3,766.18

Vehicle Delay 3 Hrs AM & PM Peak Period (thousand vehicle Hrs)	
Total Delay	7,575.42
Recurring Delay	4,463.95
Non-Recurring Delay	3,111.47
Total Delay (Auto)	7,212.13
Recurring Delay (Auto)	4,252.85
Non-Recurring Delay (Auto)	2,959.29
Total Delay (Truck)	363.29
Recurring Delay (Truck)	211.10
Non-Recurring Delay (Truck)	152.19

3 Hrs AM and PM Peak Period Cost of Congestion ($ Millions)	
Total Annual Cost of Congestion	162.84
Total Annual Cost of Recurring Congestion	94.47
Total Annual Cost of Non-Recurring Congestion	68.37
Total Annual Cost of Lost/Unproductive Time due to Congestion	147.30
Due to Recurring Congestion (Autos)	79.81
Due to Recurring Congestion (Trucks)	5.43
Due to Non-Recurring Congestion (Autos)	56.48
Due to Non-Recurring Congestion (Trucks)	5.57
Total Annual Cost of Fuel Wasted due to Congestion	15.54
Cost of Fuel Wasted due to Congestion (Autos)	8.93
Cost of Fuel Wasted due to Congestion (Trucks)	6.61
Total Annual Cost of Congestion for Auto Users/Passengers	151.33
Total Annual Cost of Congestion for Truck Operators	11.51

RCI[1] - The Roadway Congestion Index (RCI) is a measure of cars per road space; i.e. a measure of vehicle travel density on major roadways in an urban areas. An RCI value exceeding 1.0 indicates an undesirable congestion level on the freeways and principal arterial street system during the peak period.

TRI[2] - The Travel Rate Index (TRI) is a measure of the amount of extra time it takes to travel during the peak period considering only recurring delay. A TRI of 1.20, for example, indicates that it will take 20 percent longer to travel to a destination during the peak period compared to free-flow conditions.

TTI[3] - The Travel Time Index (TTI) is a measure of the amount of extra time it takes to travel during the peak period considering both recurring and non-recurring delay. A TTI of 1.20, for example, indicates that it will take 20 percent longer to travel to a destination during the peak period compared to free-flow conditions.

Figure 6: Summary report for Corridor provided in an MS Excel output file

For More Information Contact:

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The final report is available online at: http://www.state.nj.us/transportation/refdata/research/. If you would like a copy of the full report, send an e-mail to: Research.Bureau@dot.state.nj.us.

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