

C-01-29

**Quantifying Non-recurring Delay  
on New York City's Arterial Highways**

May 24, 2002

**RESEARCH PROBLEM STATEMENT**

Non-recurring delay (NRD), for purposes of this study, includes all delay caused by accidents and incidents.

While delay analysis has traditionally focused on recurring delay (caused by volumes which exceed capacity), there has been a growing focus on non-recurring delay. Data from around the country indicate that as much as 2/3 of all delay is caused by accidents, incidents, etc. Given the wide variety of causes of non-recurring delay and thus the wide variety of impacts, it is especially difficult to quantify this kind of delay at the systems level. In addition, the variety of geographic characteristics from one city to another, makes it difficult to generalize data regarding non-recurring delay; and thus it is difficult to predict, with accuracy, the impacts of non-recurring delay in a specific corridor in a specific city.

Few studies have been undertaken on quantifying non-recurring delay especially in the New York City area. What is needed is a better understanding of the impacts of incidents and accidents on delay in New York City. With such information, the Region and NYCDOT will be better able to use existing analytical tools such as CNAM, or other approved simulation models, to predict the impacts of non-recurring delay on New York City's arterial highways. In addition, this study will be able to make use of detailed incident information that will be generated by the Integrated Incident Management System (IIMS) Demonstration Project. For the first time incident delay will be collected by location of the incident, (shoulders, left, middle, right lanes, exit / entrance lanes, egress / ingress ramps) lane blockage / traffic impacts by the initial incident and the 1<sup>st</sup> / 2<sup>nd</sup> responding vehicles / teams. The IIMS project is an USDOT sponsored incident management demonstration project.

**OBJECTIVES**

The objective of this study is to fully quantify the nature of non-recurring delay in New York City. The study will determine the impacts and relationship between incident type, location, number of lanes/ ramps impacted; duration of incident per location; weather conditions, Level of Service (LOS), speed of vehicles involved and any other contributing factors to the incident. The study will develop input tables relevant to NYC that will be used for the chosen NRD model for base conditions and conditions after strategy implementation.

This study proposes to do the following:

1. Inventory tools to quantify NRD and to quantify NRD saved due to delay-reducing strategies
2. Determine the most appropriate tools given the data available
3. Using the chosen tools, fully quantify the nature of non-recurring delay (NRD) in New York City, for the current year and 6 years into the future.
4. Develop New York City specific input tables for the chosen tools

## **PROPOSED RESEARCH TASKS**

*Task descriptions are intended to provide a framework for conducting the research. NYSDOT is seeking the insight of proposers on how best to achieve the research objectives. Proposers are expected to describe research plans that can be realistically accomplished within the constraints of available funds and within the research period. Proposals must represent the proposer's current thinking in sufficient details to demonstrate their understanding of the issues and the soundness of their approach to meeting the research objectives.*

## **PROPOSED RESEARCH PERIOD**

May 2003 through November 2004

### **TASK 1/ Goals and Objectives**

Define study Goals, Objectives, and Measure Of Effectiveness (MOE's) -This should be a formal statement and listing as to what the goals of the study will be. The goals cited should be general statements of intent with each goal carrying a series of objectives with specified milestone values. MOE's should be defined to facilitate unambiguous measurement of goal attainment. The initial MOE's should include VHD, PHD and FHD. Additional MOE's will be evaluated in relation to the data collected.

**Milestone:** 6/15/03

**Deliverables:** A technical memorandum summarizing the approach taken and the results expected from each of the task efforts.

### **TASK 2/ Inventory**

Inventory existing Non Recurring Delay (NRD) models currently in use nationally:

Review existing methodologies and analytical tools (e.g CNAM) that quantify the impact of incident by duration. Summarize the analytical basis for each methodology and summarize the input parameters each methodology uses to compute NRD. Also, summarize the strengths and weaknesses of each methodology.

**Milestone:** 8/15/03

**Deliverables:** A technical memorandum summarizing both the model review and the mitigation strategy review. The results of this task should be presented on a series of matrices that compare different models via MOE's.

### **TASK 3/ Data Collection**

A comprehensive data collection effort specifically focused on New York City will be undertaken. For this effort, data collected via the IIMS program/Phase I will be used. The type of data to be collected will consist of but not necessarily be limited to:

1. No. of lanes / ramps blocked
2. Duration of blockage by location / cause
3. Location of blockage
4. Accident type/severity (extent of vehicle damage and personal injury)
5. Traffic impacts generated by 1<sup>st</sup> / 2<sup>nd</sup> responding vehicles / teams
6. Secondary traffic impacts (rubber-necking, queue dissipation) including the duration of delay caused by these secondary impacts.
7. Road/weather conditions

Undertake a full analysis of the data collected, relating delay to a variety of factors such as: incident type, duration, severity, weather conditions, highway type, volumes, speeds, level of service, density and time of day.

**Milestone:** 2/1/04

**Deliverables:** A technical memorandum summarizing the data collected with a complete listing of all sources referenced. This data will be organized in a format suitable for quantifying non-recurring delay. The technical memorandum should fully describe the impacts of non-recurring incidents, cross referenced by other factors possibly in a matrix format or other appropriate format.

### **TASK 4/ Development of New York City Specific Look Up tables for Non Recurring Delay (NRD)**

Using the information, data, and analyses developed above, develop new look-up tables for New York City. The tables will be used with an existing model to quantify incident impacts on delay and to mitigate the impacts of a matrix of strategies and alternatives specifically for NYC.

**Milestone:** 6/1/04

**Deliverables:** A new set of look up tables with information specific to NYC which can be applied to existing delay models such as CNAM. This new geographic-specific information will enable existing models to both predict the impact of incidents (singly and in clusters) and quantify their impact on total delay.

## **TASK 5/ Strategy Assessment**

Review currently used models and assess the most appropriate model for New York City's arterial system. The model should incorporate the revised NRD analytical tool outlined in Task 4.

**Milestone:** 10/1/04

**Deliverables:** A technical memorandum summarizing the conclusions regarding analysis/prediction models and methodology

## **TASK 6/ Report Preparation**

Prepare a final report on the impact of non-recurring delay and methodologies facilitating the application of current traffic simulation models. The report should include tables which when used in conjunction with approved simulation models will predict local and system level impacts of non-recurring delay events.

**Milestone:** 11/1/04

**Deliverables:** Final report. The final report will be delivered in WordPerfect or Quattro Pro format in the following forms:

5- CD ROM

25- printed documents

## **RESEARCH PRODUCTS**

A series of technical memoranda which:

**Task 1** - A technical memorandum summarizing the approach taken and the results expected from each of the task efforts.

**Task 2** - Summarize both the model review and the mitigation strategy review. The results of this task should be presented on a series of matrices that, compare different models via MOE's.

**Task 3** - Summarize the data collected with a complete listing of all sources referenced. This data will be organized in a format suitable for quantifying non-recurring delay. The technical memorandum should fully describe the impacts of non-recurring incidents, cross referenced by other factors possibly in a matrix format or other appropriate format.

**Task 4** - A new set of look up tables with information specific to NYC which can be applied to existing delay models such as CNAM. This new geographic-specific information will enable existing models to both predict the impact of incidents (singly and in clusters) and quantify their impact on total delay. The new information will also allow more accurate assessment of mitigation effectiveness.

**Task 5** - Summarize the conclusions regarding analysis/prediction models and methodology

**Task 6** - A final report delivered in WordPerfect or Quattro Pro format in the following forms:

5- CD ROM

25- printed documents

**URGENCY/EXPECTED BENEFITS**

Growing congestion is creating both quality of life and economic development impacts in the New York metropolitan area. The vast majority of analyses and alternative development has traditionally focused on recurring delay which only constitutes 1/3 of total delay. This proposed study offers the opportunity to do ground-breaking work in an area which historically has had limited data collected and minimal analyses done. This study will provide the City and the State with appropriate analytical tools to determine the impact of incidents on non recurring congestion and travel delay on the arterial highway system in NYC.

**FUNDING**

\$200,000

**RESEARCH PERIOD**

18 months

<b>TASK</b>	<b>DELIVERY DATE</b>
<b>1. Goals and Objectives</b>	6/15/03
<b>2. Inventory</b>	8/15/03
<b>3. Data Collection</b>	2/1/04
<b>4. Development of New York City Specific Look Up tables for Non Recurring Delay (NRD)</b>	6/1/04
<b>5. Strategy Assessment</b>	10/1/04
<b>6. Report Preparation</b>	11/1/04

## **SPECIAL NOTES**

### **Meetings**

Six progress meetings will be scheduled with the NYSDOT and other designated participants to discuss and coordinate the components of the NRD study. Meetings with other appropriate agencies will be coordinated through the Region. The outside agencies will include the following list, other agencies may be added if necessary:

- ✓ NYCDOT (Various Divisions: ITS Team, Planning, Surface Transit, Signals, etc.)
- ✓ NYPD (NYPD Traffic Control Division; Traffic Management Center)
- ✓ MTA Bridges and Tunnels
- ✓ MTA NYC Transit
- ✓ NYSDOT ITS Group ( Ed Roberts)
- ✓ NYSDOT Mobility Planning
- ✓ NYSDOT Region 11 Planning and Development
- ✓ NYSDOT Operations
- ✓ PANYNJ

The consultant will also prepare Technical Memos (TM) for Tasks #1 through #5. The TM's should be prepared such that they can readily be packaged into the final report with technical appendices. This will save considerable time at the end of the study. The consultant will be required to submit a draft table of contents for each TM and receive approval from the Region before proceeding.

For documentation purposes, minutes will be prepared following each meeting and distributed to meeting attendees.