NPMRDS – Probe Data Analytics Tools for Transportation Planning:

Web-based Analysis and Reporting Tools for NYSDOT and NYS MPOs

Project Partners:

University Transportation Research Center (UTRC)
NYSDOT
NYSAMPO
The NPMRDS Dashboard

NPMRDS = National Performance Measurement Research Dataset

- NPMRDS is an aggregated dataset made by the company HERE until Feb 2017, now aggregated by INRIX.
- Provided by FHWA at no cost to states.
- Based on passenger probe data obtained from a number of sources, including mobile phones, vehicles, and portable navigation devices, gathered in 5 minute intervals
  - NHS Highways are broken into segments, called "TMCs" based on navigational software company (Garmin/TomTom) needs.
- Big Data: Terrabites in size, the subset being examined contains 441,000,000 Data Points
Source of NPMRDS Probe Speed Data

- GPS
- Phone

Performance Measures
Map-21 (PM3) Reporting
Multi-Geographic Resolution:
Segment || Route || Multi-Route Corridor || Network

Creation and editing tools make your geographies fully customizable

NPMRDS Tools for PM3 Reporting
Performance Measurement Tools at MPO and County Level: Compare PM3 measures of MPOs across the state.

**Map-21 Performance Measure Scores by Segment**

**Hours of Delay in the Capital Region (CDTC)**
Pinpoint Analysis of PM3 Performance Measures

The tool-suite contains a range of visualizations that allow planners to slice and dice the data to identify root causes of poor performance or to monitor the performance of a route or corridor.

PM3 Performance Measure Uses

- Statewide measures are provided for all NHS Travel Time related PM3 measures
- To aid required target development and analysis, the same measures are also computed at the MPO, county levels. Maps are available showing individual TMC scores.
- Annual data going back to 2013 has been downloaded and incorporated in the tool suite for time series analysis and multiple year comparisons
- Calculation algorithms for each measure are being reviewed to ensure consistency with Final PM3 rule requirements
- SUNY AVAIL has possession/access to all other state NPMRDS data sets, so that regional analysis or other multi-state analysis/comparisons are possible
Leveraging NPMRDS for uses beyond FHWA performance measurement requirements

- Corridor Analysis
- Network Analysis
- Bottleneck Identification
- Project Prioritization
- Post-Project Analysis
- Incident Post-mortem Analysis

NPMRDS is not just for USDOT Performance Measures

- NPMRDS speed and travel time data compliments more traditional (and expensive) highway performance data collection tasks
- Dashboard concept is designed to incorporate other databases that can expand the analysis scope beyond the PM3 measures.
  - Integrating LRS into the Dashboard (underway) will significantly enhance the ability to bring in data from AGILE ASSETS and other existing NYSDOT databases.
- Other planning and analysis uses for the Dashboard are either underway or contemplated.
TMC Analysis Tools for Congestion Management Planning

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TMC Analysis Tools for Congestion Management Planning
Comparison of Arterial Segment to Interstate Segment

Interstate Segment

Arterial Segment

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Speed Distribution By Peak (15 minute bins)
TMC Analysis Tools for Congestion Management Planning

Network Analysis Tools for Incident Detection and Analysis
Data Integration

AVAIL has begun to integrate many other geo-spatial transportation datasets through conflation of the NPMRDS shapefile to the LRS and HPMS shapefiles.

AADT and Short Counts

Albany Visualization and Informatics Lab
Transearch
Socio-economic-demographic effects of transportation network,
- Census/Infogroup etc.
- Site-Specific Volume Delay Functions
- Imputed Counts using Probe Data
- Multi-modal GTFS
- Merging real-time probe data with historic analytics for forecasting
  - Statistical Probability Distributions based on time of day and current counts/speeds,

Examples of NPMRDS Based Analysis

Speeds and Travel Times were significantly faster the week of July 10-14 (the red line in the line graph), than the week of Jun 12-16 (the blue line in the line graph).
Corridor Analysis Tools
Penn Station Amtrak Track Work

Comparing traffic on the LIE entering Manhattan from July 10-14, 2017 to June 12-16, 2017

The LIE Week of July 10-14

14 Minutes Faster | Over 3,500 Hours of Delay less than the average week

K-Bridge Analysis
Corridor Analysis Tools
K-Bridge Westbound Jan-Apr 2017 vs. May-Jul 2017

Speeds have increased since the opening of the new spans of the K-Bridge Westbound (May-Jul 2017 – the Blue Line) versus before (Jan – Jun 2016 – the Red Line).

Corridor Analysis Tools
K-Bridge Eastbound Jan-Apr 2017 vs. May-Jul 2017

The Eastbound speeds have increased more significantly between (May-Jul 2017 – the Blue Line) versus before (Jan – Jun 2016 – the Red Line) and daily-avg-hours-of-delay is down 64%.
The graph on the left shows an average day in five minute epochs from 6am to 7pm. The blue line is for 2016 data. The red line is for 2015 data.
Post Project Analysis Case Study:
The Tappan Zee Bridge Cashless Toll Project

The metrics can be changed via the dropdown menu. This graph now shows hours of delay of an average day, by 5-minute epoch. Blue is 2016, Red is 2015.

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The red line on the 2015 graph indicates the slower speeds of the TMC segment where the toll booths were previously located. The graph from 2016 shows significant speed increases at that TMC segment.

There also appears to be a new bottleneck “down stream” from the toll booth (at the I-287 and I-87 Interchange). This new bottleneck may have been metered by the cash toll.
Post Project Analysis Case Study: The Tappan Zee Bridge Cashless Toll Project

The graphs above show hours of delay by segment and by time of day. Cost of delay can be calculated.

Post Project Analysis Case Study: The Tappan Zee Bridge Cashless Toll Project

<table>
<thead>
<tr>
<th>Route Name</th>
<th>Speed</th>
<th>Travel Time</th>
<th>Total Hours of Delay</th>
<th>Avg. Hours of Delay</th>
<th>LOTTR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tappan Zee South3 01/15-12/15</td>
<td>42.75</td>
<td>12.17</td>
<td>1549.61</td>
<td>60.51</td>
<td>1.27</td>
</tr>
<tr>
<td>Tappan Zee South3 01/16-12/16</td>
<td>45.19</td>
<td>11.46</td>
<td>1579.39</td>
<td>54.83</td>
<td>1.23</td>
</tr>
</tbody>
</table>

Comparison Tables can convey a lot of information relatively quickly. Here we see that Speed has increased by 5.8%, Travel Time has decreased by 6.2%, Hours of Delay has decreased by 10.4%, and Level of Travel Time Reliability is up 2.8%.
Incident Analysis
Beer Truck Rollover on the BQE
Incident Case Study: Beer Truck Rollover on the BQE

<table>
<thead>
<tr>
<th>Route Name</th>
<th>Speed</th>
<th>Travel Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>BQE NB 01/16-12/16</td>
<td>18.71</td>
<td>42.76</td>
</tr>
<tr>
<td>BQE NB 08/16-08/16</td>
<td>11.76</td>
<td>65.82</td>
</tr>
</tbody>
</table>
Corridor Analysis
I-87 Northbound to the Twin Bridges
2015 vs 2016
Corridor Analysis Tools
I-87 Northbound to the Twin Bridges

20+ Visualization and Analysis Tools for assessing the traffic patterns of a route or corridor and for comparing the route against itself in various time aggregations as well as against other routes.

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Corridor Study Tools
I-87 Northbound to the Twin Bridges

Compare 2015 and 2016
For Various Metrics Including:
Speed, Travel Time, Hours of Delay, Travel Time Index, Buffer Time Index, Planning Time Index, VMT, Counts, and more.

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Corridor Study Tools
I-87 Northbound to the Twin Bridges

Travel Time

Hours of Delay

Buffer Time Index

Planning Time Index

Data Integration

Construction in 2015 may be the cause of reduced speeds in 2015

Transcom Incidents

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Corridor Analysis
I-87 Northbound to the Twin Bridges

Incident at the Twin Bridges

Incident Analysis

This case study shows an incident on I-87 Northbound at the Twin Bridges from November 21, 2016
Incident Analysis

Hours of Delay Graph

Incident Analysis Graph

Hours of Delay and Cost of Delay associated with the selected incident

Albany Visualization and Informatics Lab

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