



Accelerating solutions for highway safety, renewal, reliability, and capacity

Regional Operations Forum

Performance Measurement

Four Guiding Questions

1. What are conditions like out there?
2. How does this compare to my peers?
3. Are things better or worse (trends)?
4. Did my program have anything to do with it (investments)?

We can't answer these fundamental questions without performance measurement

Why Operations Performance Measures?

“What gets measured gets managed!”

Why Do Performance Measurement? (Internal Story)

- How will we get better? How do we compare?
- Who gets paid to reduce congestion and crashes?
 - Um, uh, er, anyone??
- Allows operations to compete in idea marketplace
- Similar to other data intensive programs
- Tell a good story for budget justification
 - % of pavements in Good or better
 - # of structurally deficient bridges
 - *# of operating dynamic message signs...really care???*

Performance Measurement Today (What the heck is going on out there?)

- Lots of data to support performance measurement
 - Quality, completeness, and coverage
 - Many data sources for the same measurement (Ex: travel time)
 - Collection/acquisition/preparation cost
- Measures
 - Are we measuring the right things?
 - Targets and benchmarks
- Interpretation
 - Understanding “outside of our control” factors
 - Allocation of funding based on performance

MAP-21 Staged Rulemaking

NPRM DATE	MEASURE CATEGORY
STATUS I NPRM 1Q '14 Final 1Q '16	✓ Serious Injuries per VMT
	✓ Fatalities per VMT
	✓ Number of Serious Injuries
	✓ Number of Fatalities
STATUS II NPRM 1Q '15 Final 2Q '16	✓ Pavement Condition on the Interstates
	✓ Pavement Condition on the Non-Interstate NHS
	✓ Bridge Condition on NHS
STATUS III NPRM 1Q '16 Final ?	• Traffic Congestion
	• On-road mobile source emissions
	• Freight Movement
	• Performance of Interstate System
	• Performance of Non-Interstate NHS

Then, effective date, targets and reporting.

Proposed Performance of the National Highway System, Freight Movement on the Interstate, Congestion and Air Quality Performance Measures

Part 490 Subpart	Proposed Performance Measures	Proposed Metrics	Applicability
Performance of the National Highway System (NHS) (Subpart E)	Percent of Interstate System providing for Reliable Travel Times	Level of Travel Time Reliability (LOTTR)	Interstate System mileage within the State or each MPA
	Percent of the non-Interstate NHS providing for Reliable Travel Times	Level of Travel Time Reliability (LOTTR)	Non-Interstate NHS mileage within the State or each MPA
	Percent of the Interstate System where Peak Hour Travel Times meet expectations	Peak Hour Travel Time Ratio (PHTTR)	Interstate System mileage within each urbanized area with a population over one million
	Percent of the non-Interstate NHS where Peak Hour Travel Times meet expectations	Peak Hour Travel Time Ratio (PHTTR)	Non-Interstate NHS mileage within each urbanized area with a population over one million
Freight Movement (Subpart F)	Percent of the Interstate System Mileage providing for Reliable Truck Travel Times	Truck Travel Time Reliability (TTTR)	Interstate System mileage within the State or each MPA
	Percent of the Interstate System Mileage Uncongested	Average Truck Speed	Interstate System mileage within the State or each MPA
CMAQ Traffic Congestion (Subpart G)	Annual Hours of Excessive Delay Per Capita	Total Excessive Delay	NHS roads in urbanized areas with populations over one million that are, all or in part, designated as nonattainment or maintenance areas for ozone (O ₃), carbon monoxide (CO), or particulate matter (PM)
CMAQ On-Road Mobile Source Emissions (Subpart H)	2- and 4-year Total Emission Reductions for each applicable criteria pollutant and precursor	Annual Tons of Emission Reductions by project for each applicable criteria pollutant and precursor	All projects funded by CMAQ program in areas designated as nonattainment or maintenance for O ₃ , CO, or PM for each State or MPA

Strategic Planning: Foundation for Performance Based Management

- “What do we want to achieve with operations?”
 - Improved congestion/mobility and reliability
 - Many safety and environmental benefits flow from improved congestion
- Performance measures are a vital part of the strategic planning process
 - Can be specific to operations or part of agencywide strategic planning
 - Used to track progress toward meeting goals and objectives

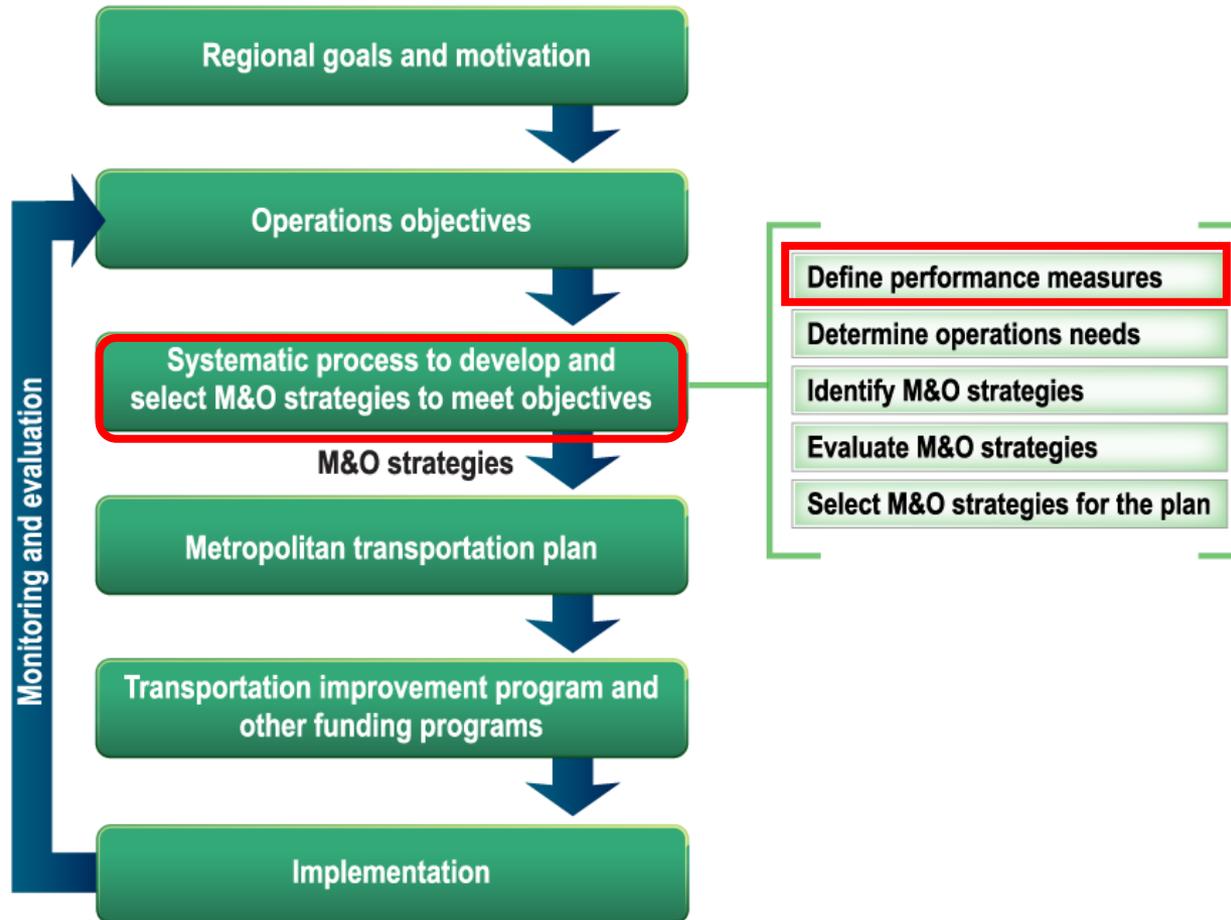
Performance Measures: Key Considerations

- Clear link to agency goals
- Relevant to policy-makers and the public
- Intuitive **or** easy to understand
- Outcome influenced by agency program and policy decisions
- Communicate the core mission of the organization
- Reliable data must be available
- Manageable number of measures
- Must be capable of showing a trend

Performance Measures: Key Considerations

- ***When?*** Peak, Off-peak, Weekend
- ***Where?*** Corridors, sub-regions, metro areas, state
- ***What?*** Need both vehicle and person-based performance measures
- ***Why?*** ... did it happen? Requires long period of inter-agency & intra-agency cooperation
- ***How?*** Examine 3 dimensions of congestion:
 - How bad? Where bad? When bad?
- ***Another How?*** Linking - Have a few measures that connect across applications and time frames

Performance Measures and the Planning Process



Definitions of Terms: Types of Measures

- Input
 - Amount of resources devoted to a process or activity
 - E.g., staff-hours, number of service patrol vehicles
- Output (a.k.a., activity-based)
 - Physical quantities of items; levels of effort expended, scale or scope of activities; important to the system operator
 - E.g., number of service patrol vehicle assists
- Outcome
 - Measures typically experienced by the user
 - E.g., average travel speeds, on-time transit performance

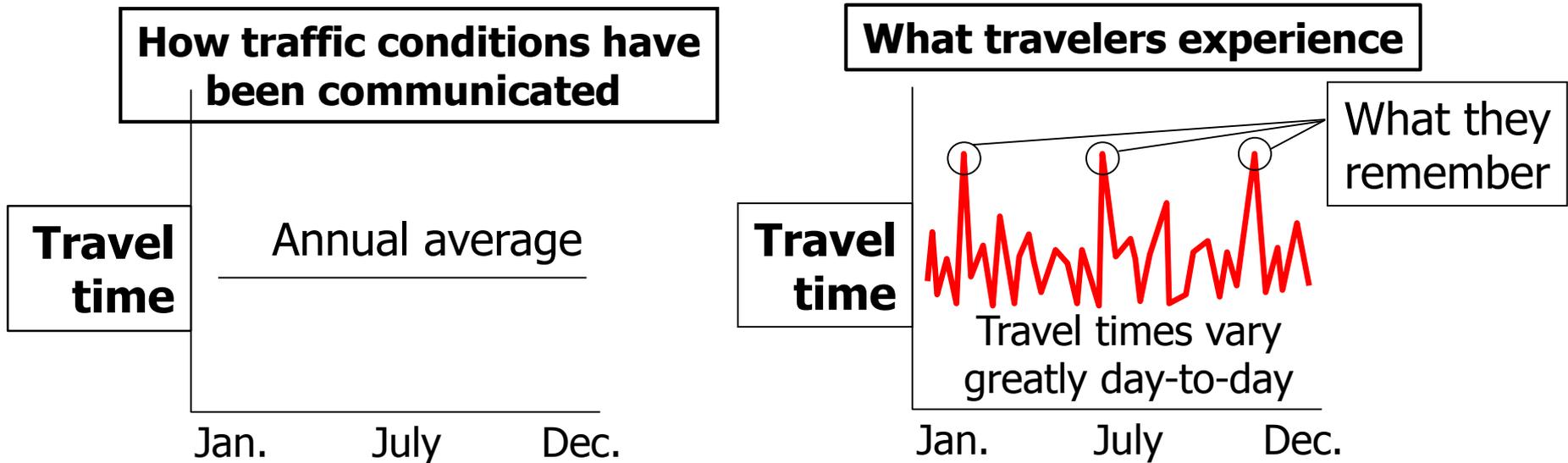
Examples of Transportation System Performance Measures

Travel time	Average travel times; Average travel speeds
Congestion extent	Lane miles of congested conditions Average hours of congestion per day
Delay	Vehicle-hours of recurring delay Non-recurring delay
Incident occurrence/delay	Median minutes from time of incident to clearance
Travel time reliability	Buffer time; Buffer time index
Transit performance	On-time performance Transit travel times in comparison to personal vehicle travel times
Customer satisfaction	Percent reporting being satisfied
Person throughput	Peak hour persons moved per lane

Why Is Reliability Important?

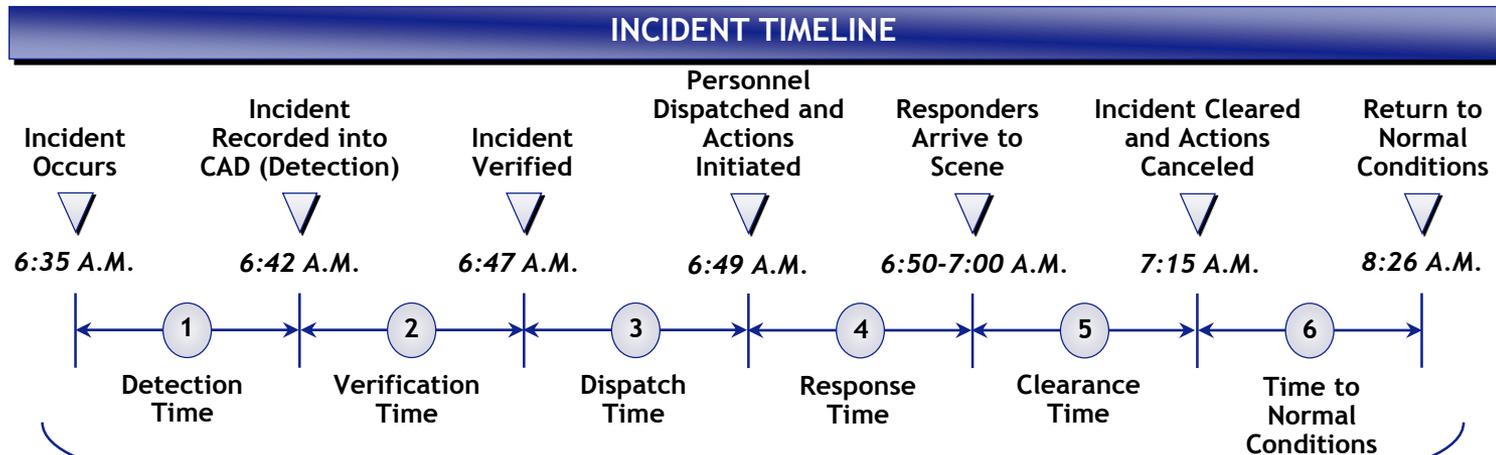
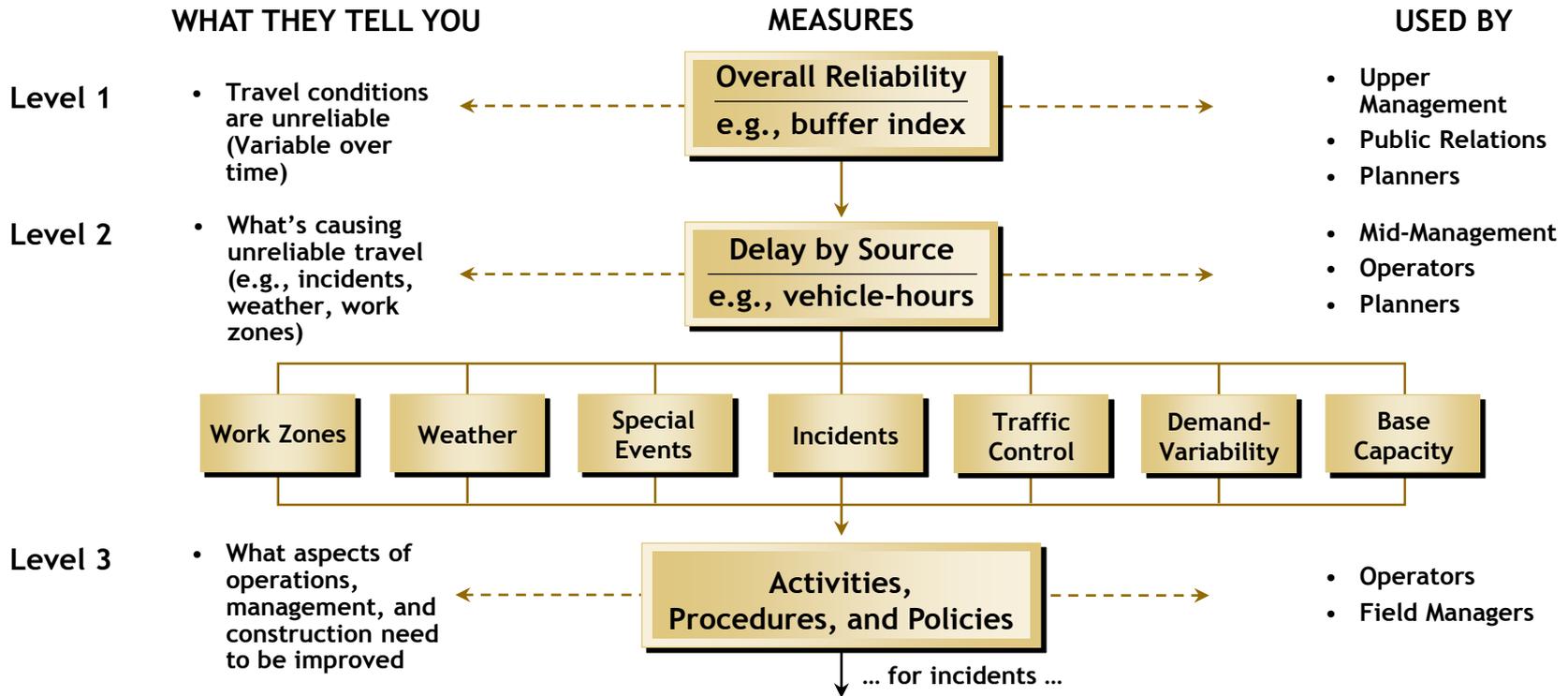
- Less tolerance for unexpected delay
- Planning for unreliable travel has costs for users
– late & early arrivals!
- Economic competitiveness
- Valued service in other utilities & industries
- This is how we can “solve the problem”
- Can be treated effectively by addressing roadway “events”

Averages don't tell the full story



When Mn/DOT's ramp meters were turned off in 2000:

- Average travel time was 22 percent worse
- Reliability was 91 percent worse



Reporting, Accountability, Decision Making

- You have goals, you have data, you have measures – what is next?
- Hint – You’re already behind; have a story first!
- Develop measures and meanings
- Report the results!!
 - To the public & decision makers
 - To system operators and planners
- Use them!! -- Funding decisions, operational strategies, new designs, before/after, new data

Real-Time Applications

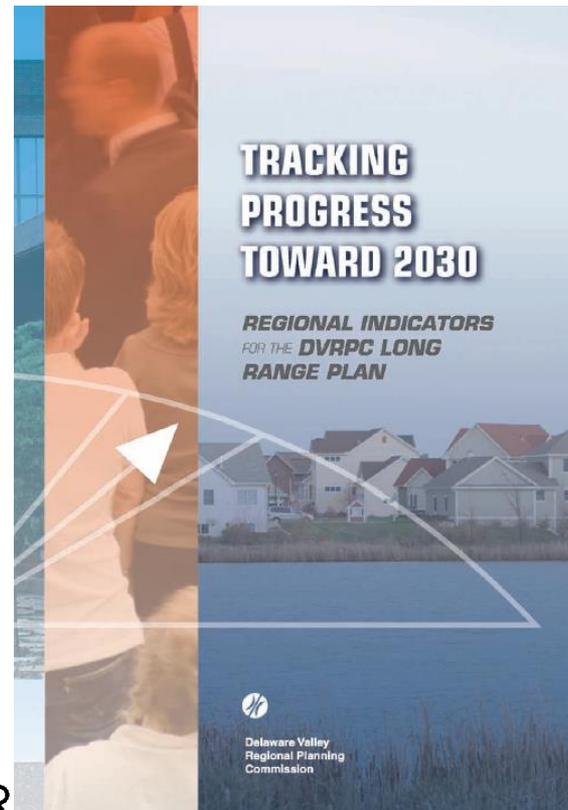
- Tailored to local issues, tastes, public understanding and terms – **Whatever works!!**
 - Developing “generic” guidelines -- difficult
 - Lots of examples are available
- Use the historical real-time information
 - Relatively new, but detailed data sets
- Peak period usually; off-peak important for just-in-time manufacturing
- Color coding very useful

Reporting

- The big difference between audiences is not what you **SAY**, but **HOW** you say it and **WHAT** measures you highlight
- Use examples and summaries to illustrate the key points
- Use chart title to tell story
- Use captions to note key points
- **What is the “ask”? (“what they do after they hear you”)**

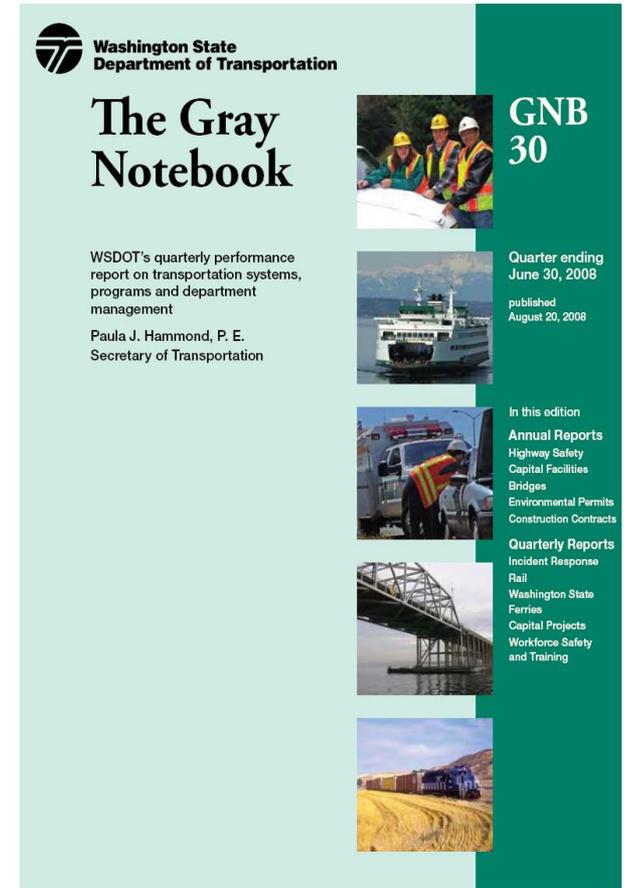
Communicating Results: DVRPC (Philadelphia MPO)

- Periodic reports (e.g., regional congestion reports, “State of the Commute” reports, performance dashboards)
- Brochures and newsletters
- Websites

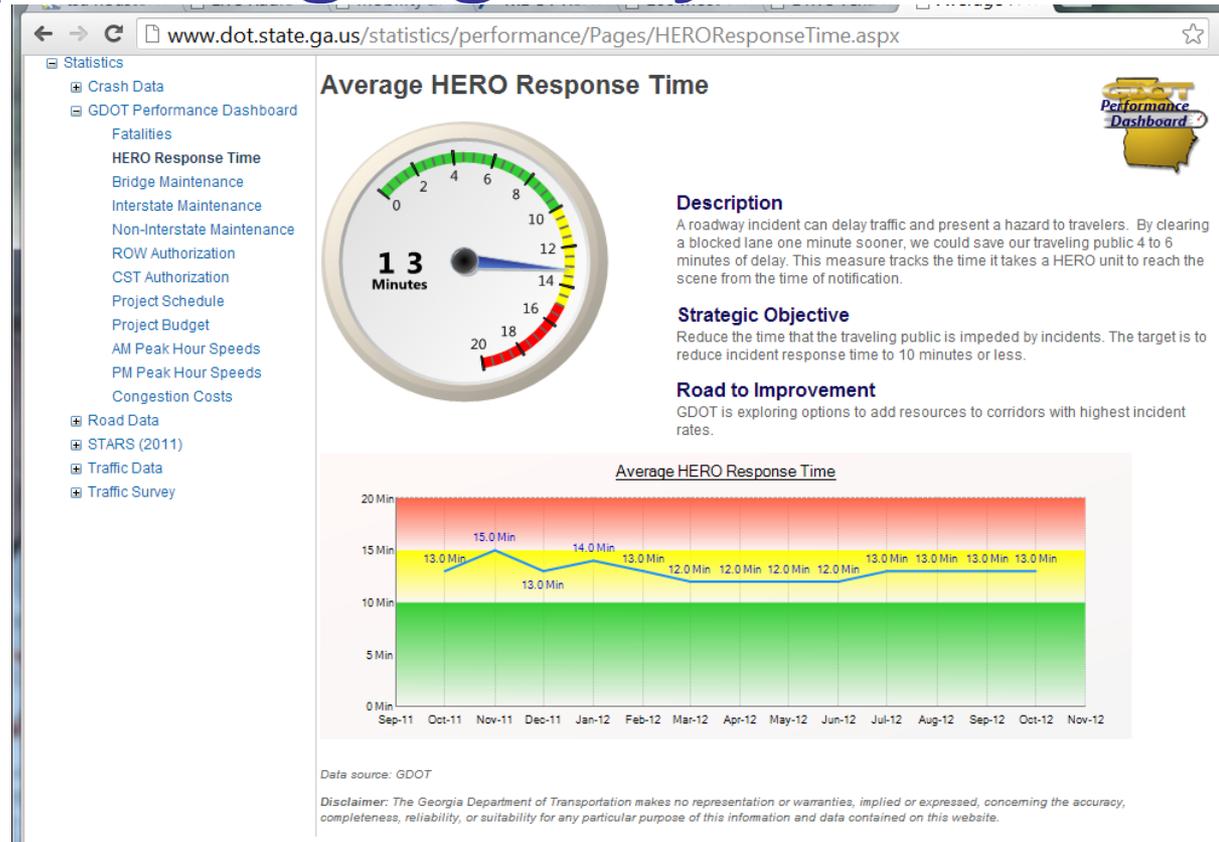


WSDOT's *Gray Notebook*

- WSDOT's Strategic Approach
 - Accountability and Transparency
 - Comprehensive Performance Analysis and Reporting
 - Adaptive and Dynamic Performance Measurement
- Communicating Two Simple Themes:
 - Accountability
 - Project Delivery

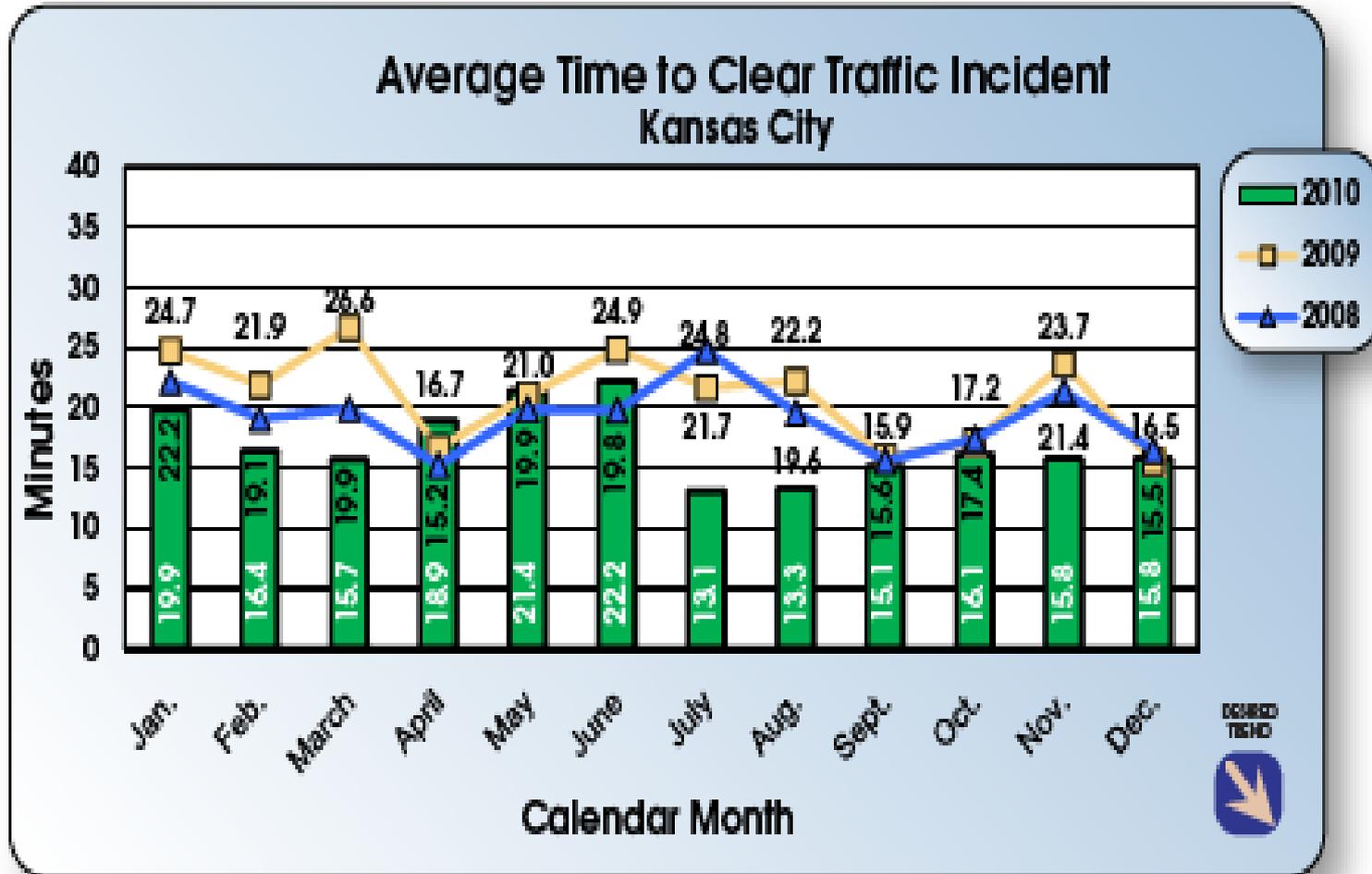


GDOT HERO Incident Response: Explaining Agency Performance



<http://www.dot.state.ga.us/statistics/performance/Pages/HEROResponseTime.aspx>

KC SCOUT Clearance Times



Leveraging ITS Data - Travel Time Analysis

The Annual Congestion Report highlights the performance of 52 Puget Sound region commute corridors (GP and HOV lanes): Average Travel Time (@posted speed); (worst 5 min) Peak Travel Time; Maximum Throughput Travel Time (@51 mph); 95th percent Reliable Travel Time

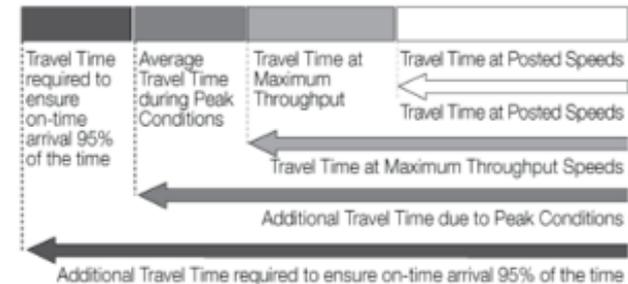
Travel times at posted speeds, maximum throughput speeds, peak travel times, and 95% reliable travel times

Morning and afternoon commutes by work location

Central Puget Sound area, 2007

General Purpose (GP) and High Occupancy Vehicle (HOV) Commutes; Travel time in minutes

- Travel Time at Posted Speeds with no congestion (in minutes)
- Travel Time due to Peak Condition (in minutes)
- Travel Time at Maximum Throughput Speeds 51 mph (in minutes)
- Travel Time required to ensure on-time arrival 95% of the time (in minutes)



All AM Commute Average - Home to Work

Work Location

All PM Commute Average - Work to Home



Congestion on Freeways Delay in Q4/2011

All time in Q4/2011

12.3 Hours

→ **\$237***

per traveler
per month
during Q4/2011



vs. Q4/2010

*Cost of time = \$19.24/ hour (Derived from TPB model & Travel Survey)

(see p. 3)

Reliability on Freeways Extra Time for On-Time Arrival** in Q4/2011

AM Peak (6 – 10 AM)

202%

of free flow travel time



vs. Q4/2010

PM Peak (3 – 7 PM)

236%

of free flow travel time



vs. Q4/2010

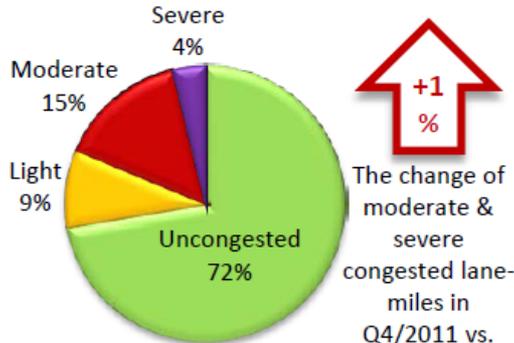
*pp: percentage points.

**This is compared to free flow travel time. For example, a 20-minute free flow travel with 200% extra time for on-time arrival indicates one has to budget a total of 20 * 200% = 40 minutes to arrive on time (this measure essentially is Planning Time Index).

(see p. 4)

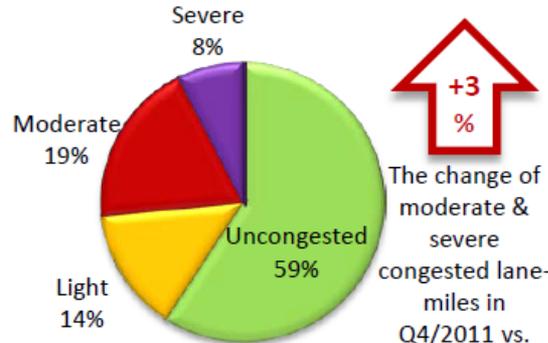
Percentages of Freeway Lane-Miles by Congestion Level in Q4/2011

AM Peak (6 – 10 AM)



The change of moderate & severe congested lane-miles in Q4/2011 vs. Q4/2010.

PM Peak (3 – 7 PM)



The change of moderate & severe congested lane-miles in Q4/2011 vs. Q4/2010.

Congestion level	Ratio of experienced travel time to free flow travel time
Uncongested	< 1.15
Light	1.15 - 1.3
Moderate	1.3 - 2
Severe	> 2

(see p. 5, 6 & 7)

Spotlight

Traffic on "Black Friday"

The region's overall freeway traffic was examined for the day after Thanksgiving in the past 4 years and the results revealed significant changes in 2011.

(see p.15)

Lessons for Plan Development: Getting Started

- Get the key people involved from the start and keep them “in the loop”
 - Includes senior-level people involved in transportation planning and programming
- Allocate plenty of time for developing consensus goals
 - Write a memo – spend 2 years implementing
 - ...or, spend 6 months gaining consensus, implement along the way

Performance Measure System Design

- How do the performance measures get reported?
- How are performance measures used by:
 - Those who have required them?
 - Staff level?
- What have been the costs of :
 - Data collection?
 - Analysis and reporting?
- Where are the overlaps? How can they be better coordinated? More efficient?

Key Considerations

- What are the most important stories?
 - What do the audiences need to know?
- How do the measures connect with the likely decisions and investment options?
- What are the most important measures?
(Recognizing there will be many measures).
- Where does the data come from?
- What is the “ask”? (“what they do after they hear you”)

The Operations Performance Measurement Plan

- Fewer measures are better
 - “Measure like you mean it”
- Choose measures that are understandable to intended audience
 - Internal staff and bosses
 - General public & decision makers
- Get started now, use current data and I.T.
- Focus on known & big problems; estimate the rest

Summary

- Start slow but start now! Perfect data and analysis rarely occurs.
- There is no perfect set of measures
 - Data, analysis, audiences evolve
- Use existing data assets; ensure quality control.
- Data + Analysis + Communication = Credibility (Need all 3)
- Data-facilitated decisions improve all factors in the process
- If you don't tell your story with your data and measures – someone else will

Operations Performance Measures: Resources

- FHWA Operations Performance Measures Website
 - Example Programs
 - http://www.ops.fhwa.dot.gov/perf_measurement/example_programs.htm
- Other Sources
 - AASHTO Standing Committee on Performance Measures
 - TRB Performance Measurement Committee
 - I-95 Corridor Coalition Probe Vehicle Data Project/Performance Measures Project