Proceedings of the MAP-21 Performance Management Data Assessment Workshop

August 24-25, 2015

Sacramento, California

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Preface

The Proceedings of the MAP-21 Performance Management Data Assessment Workshop were produced by Kamal Sah of Caltrans, with support from Laura Melendy of the Institute of Transportation Studies, UC Berkeley, and Jacob Olson and Will Cuper of the Highlands Consulting Group, LLC.

Special thanks to Giles Giovinazzi of Caltrans, as well as the Caltrans Performance Management Team Leads: Michael B. Johnson, Thomas Schriber, and Joanne McDermott for their support and direction throughout the planning and execution of the workshop. Also, to Frances Harrison of Spy Pond Partners, LLC, Dave Vautin of MTC, and Dan Landon of the Nevada County Transportation Commission for their contributions to the workshop and these proceedings, and to all the speakers and presenters who made the workshop a success.

Introduction

The California Department of Transportation (Caltrans) hosted a Data Assessment Workshop in Sacramento, California on August 24-25, 2015 to present an overview of new federal performance management requirements under the Moving Ahead for Progress in the 21st Century Act (MAP-21), and to begin a dialogue on aligning state and local transportation agencies to successfully implement forthcoming rules. This workshop, intended to focus strictly on data assets to support performance management, is expected to be the first in a series of dialogs ultimately leading to establishment of performance measures and targets for California. The workshop was also focused on the statewide readiness of the onset of the final performance measure rules and what existing data sources are available to comply with the rules, as well as identify the data gaps that currently exist.

Background

MAP-21 directs the U.S. Secretary of Transportation to establish performance measures related to statutory national performance goals for safety, infrastructure condition, freight movement, environmental sustainability, and other areas. State Departments of Transportation (DOTs) and other Federal-aid highway grantees are expected to set and maintain targets based on the U.S. Department of Transportation-defined (USDOT) performance measures, collect data, and report to the USDOT their progress in meeting their targets. Ultimately, these performance measures and targets are intended to influence Federal-aid highway planning, programming, and spending decisions in furtherance of national goals.

Throughout 2015, Caltrans has been engaging California stakeholders in providing comments on proposed federal rules that will establish MAP-21 performance measures. Some of these rules may be finalized as early as Fall 2015. As final federal rulemaking draws nearer, Caltrans is leading the effort now to educate and prepare the state for implementation.

Understanding the status of current data collection efforts, data resources, limitations, and gaps will be an important first step. A recent U.S. Government Accountability Office report revealed that state DOTs and other federal-aid highway grantees nationwide are anticipating data challenges implementing new federal performance measure rules. For example, some federal-aid grantees anticipate that they will need to collect additional data and also expressed a need for greater state and local collaboration to successfully implement these rules.

To prepare for MAP-21 Performance Management rulemaking and implementation, Caltrans took a series of steps leading to this MAP-21 Performance Measures Data Assessment Workshop for California, including:

- Establishing a website as a clearinghouse for MAP-21 Performance Management information that relates to California (http://www.dot.ca.gov/hq/transprog/map21/map21_implementation.htm) [see Figure 1],
- Appointing a Performance Management leadership team and a Caltrans designated Data Steward for each target area [see Figure 2],

- Reviewing performance management related literature and surveying efforts of other state DOTs in this area [see Appendix E. Best Practices for Data Inventory/Self-Assessment],
- Conducting a series of internal meetings and interviews around each of the target areas and data assets, and
- Convening a workshop planning committee made up of stakeholders representing transportation interests from state, regional, and local agencies:

Name	Title	Agency
Elisa Arias	Principal Regional Planner	San Diego Association of Governments
Melissa Garza	Principal Regional Planner	Fresno Council of Governments
Naresh Amatya		Southern California Association of Governments
Jerry Barton	Senior Transportation Planner	El Dorado County Transportation Commission
Aimee Kratovil	Director of Performance Management	FHWA California Division
Melissa White	Director of Policy and Legislation	California Association of Councils of Governments
Daniel Tran	Associate Regional Planner	Southern California Association of Governments
Rachel Kennedy	Senior Regional Planner	San Diego Association of Governments

Figure 1. Caltrans MAP-21 Website

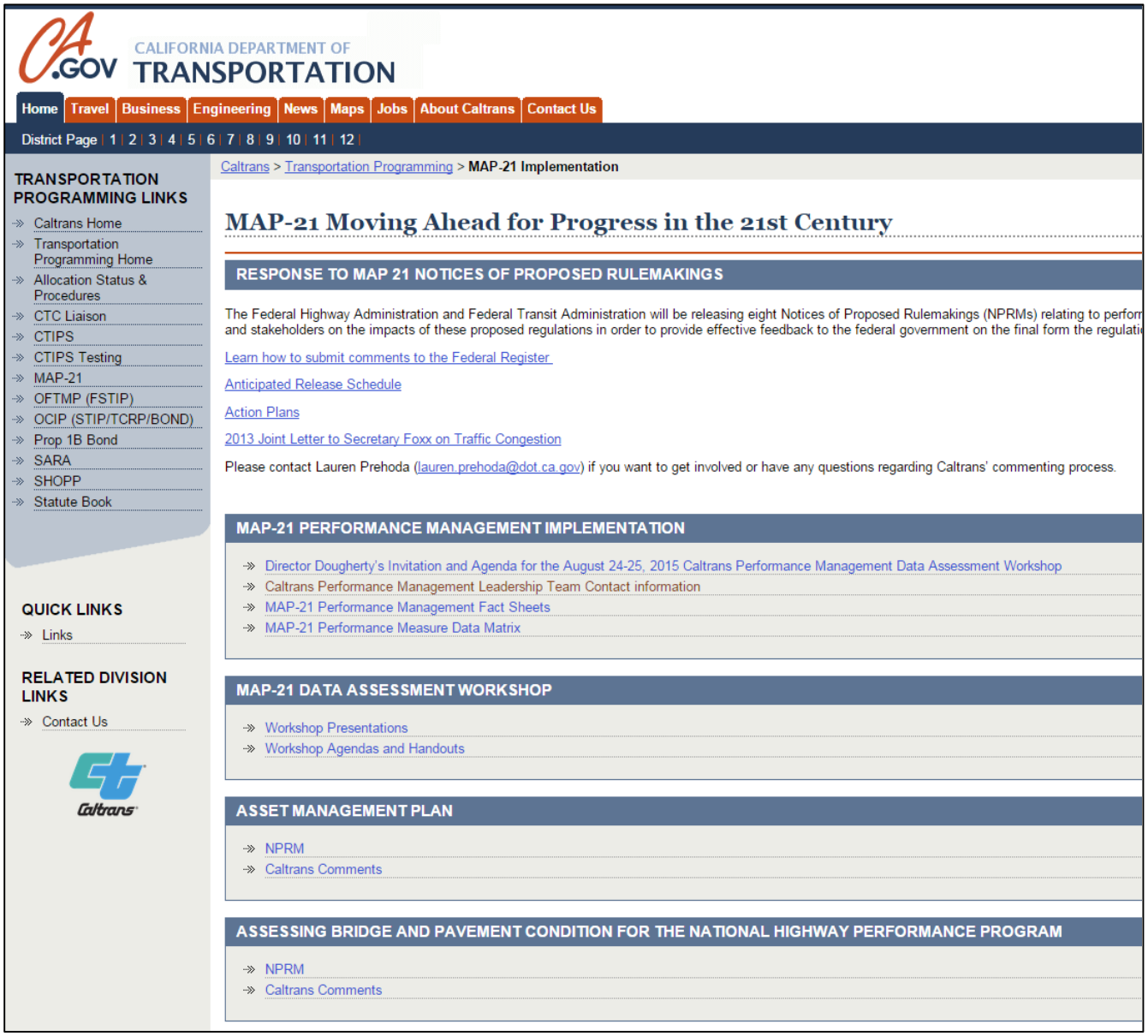

Figure 2. MAP-21 Performance Management Team Leads & Data Stewards

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Culverts	Maintenance	Parviz Lashai parviz.lashai@dot.ca.gov; (916) 654-5784
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Objectives

The two-day Data Assessment Workshop was convened to present an overview of the performance measurement target areas and to begin the discussion of how local, regional, and state agencies can partner towards meeting the requirements and submitting accurate and standardized data to the federal government. The workshop was also intended to provide a forum for California stakeholders to identify data assets and gaps, mitigation measures, and potential policy decisions required to implement performance rules.

Caltrans and the Federal Highway Administration (FHWA) provided brief updates on the status of the Performance Management rulemaking process, identified the Caltrans MAP-21 Performance Management leadership team and Data Stewards, and outlined additional stakeholder engagement activities that Caltrans has and will undertake to prepare the state for MAP-21 Performance Management target setting and implementation. Caltrans Data Stewards prepared target area specific presentations and hosted stakeholder dialog for each of the target areas, including:

- Pavements
- Bridges
- Congestion Mitigation and Air Quality (CMAQ)
- System Performance
- Freight
- Safety

In addition to specifically addressing the target areas, the workshop also included presentations on the following topics:

- Culverts
- Intelligent Transportation System (ITS) Elements
- Risk Mitigation Plan Development
- Linear Referencing System (LRS)

Participants

The Data Assessment Workshop planning committee invited numerous representatives from Caltrans, FHWA headquarters and California Division, other state agencies, including CHP, OTS, and DMV, regional and local transportation agencies statewide, and other stakeholders to participate in the workshop. The workshop was attended by 130 people; approximately 50% from Caltrans, 25% from regional and local entities, and the remainder made up of staff from federal agencies, universities, and private companies.

Speakers and presenters during the two-day workshop included:

Workshop Moderator

- **Giles Giovinazzi**, Federal Transportation Liaison, Caltrans

Speakers

- **Malcolm Dougherty**, Director, Caltrans
- **Vince Mammano**, Administrator, California Division, FHWA
- **Peter Stephanos**, Director, Office of Transportation Performance Management, FHWA
- **Dave Vautin**, Senior Transportation Planner, Metropolitan Transportation Commission
- **Dan Landon**, Executive Director, Nevada County Transportation Commission
- **Frances Harrison**, Chief Technical Officer, Spy Pond Partners, LLC

Presenters

- **Michael Johnson**, Principal Transportation Engineer, State Asset Management Engineer, Director's Office, Caltrans
- **Tom Pyle**, Supervising Transportation Engineer, Chief, Office of Pavement Management, Division of Maintenance, Caltrans
- **Matt Friedman**, Senior Transportation Planner, Chief, Asset Management Branch, Division of Traffic Operations, Caltrans
- **Parviz Lashai**, Supervising Transportation Engineer, Chief, Office of Stormwater and Environmental Compliance, Division of Maintenance, Caltrans
- **Shanna Everts**, Staff Services Manager II, Ethics and Workforce Planning Manager, Office of Enterprise Risk Management, Caltrans
- **Eric Strader**, Staff Services Manager 1, Risk Program Manager, Office of Enterprise Risk Management, Caltrans

- **Mark Samuelson**, Supervising Transportation Engineer, Acting Chief, Division of Research, Innovation, and System Information, Caltrans
- **Joe Hausman**, Highway Performance Monitoring System Program Review Coordinator, FHWA
- **Greg Yarbrough**, DTS GIS
- **John Wisdom**, CDM Smith
- **Dennis Jacobs**, Senior Transportation Engineer, Office of Federal Transportation Management Program ,Division of Transportation Programming, Caltrans
- **Rich Stone**, Senior Transportation Engineer, Monitoring and Analysis Branch, Division of Traffic Operations, Caltrans
- **Joanne McDermott**, Senior Transportation Planner, Office of Sustainable Community Planning, Division of Transportation Planning, Caltrans
- **Thomas Schriber**, Supervising Transportation Engineer, Chief, Office of Performance, Division of Traffic Operations, Caltrans

Key Findings and Observations

On August 18-19, 2015, Frances Harrison from Spy Pond Partners participated in a data workshop sponsored by the California Department of Transportation. On the second day of the workshop, she delivered a presentation on national research products related to data supporting MAP-21 performance management. The following summarizes her observations from the workshop.

General

- Presentations covered all of the MAP-21 required performance areas, as well as additional infrastructure condition measures required by California state law.
- Participants were thoroughly briefed on the current proposed federal rules, and existing state and local activities related to monitoring and improving performance for the MAP-21 performance areas.
- This was an opportunity for participants to get up to speed and gain the background required to begin informed discussions about collaboration approaches.
- This meeting set the stage for future, more detailed discussion about collaboration on data gathering, updating and analysis in support of coordinated performance management functions.
- Participants agreed that they want to see the final rules before moving too far in developing monitoring and target setting approaches.

Key Areas of Concern

- Pavement
    - Pavement IRI data: IRI is not currently collected off of the state highway system, and local agencies are satisfied with use of the PCI as the primary pavement condition measure. In addition, Caltrans notes issues with low speed IRI data collection in urban areas.
    - Pavement cracking, rutting and faulting data for non-state maintained NHS: Based on informal conversation, it appears that there is a fair amount of consistency across local agencies in measurement protocols, PCI calculation method and software used. The cracking, faulting and rutting elements in HPMS (and included in the pavement NPRM) could potentially be calculated from the source data for PCI. Caltrans has committed to collecting both IRI and the cracking, rutting and faulting measures statewide for two years. The state-collected data could be compared to the locally collected data to determine if future cracking, rutting and faulting data could be sourced from local agency data already being collected.
    - One logical next step would be to estimate the incremental cost (per mile) to Caltrans of collecting and processing IRI data on non-state NHS roads; and identify the incremental cost (per mile) for the cracking, rutting and faulting measures – and share this information with local jurisdictions in order to facilitate future discussions about data collection responsibilities following the initial 2 year time period.
    - In principle most participants seemed to feel that centralized collection is a good idea – but support will likely depend on costs. Many communities have very small amounts of NHS mileage – high cost of mobilization for small data collection effort.

- Bridge
    - Recently rolled out new method for inspection – which changes the baseline for condition assessment (do 1,000 inspections per month – will take 4 years for all bridges to be inspected with the new method) – challenge to set targets during this transition period.
    - California does element-level inspections; has own method to generate NBI ratings; testing found that it generally comes out to be +-1 point from an independent NBI rating.
- Road Inventory
    - Opportunities for future collaboration on updating the MIRE data but more discussion is needed on both which data elements would be maintained and software and responsibilities to manage the update process.
- System Performance
    - Existing PeMS system is currently providing useful information for the urban portions of the state highway system, but further discussion about MPO use of PeMS for the MAP-21 system performance requirements and expansion of system performance data coverage is needed.

Additional Notes

- California must comply with state law regarding asset management and target setting – which has different requirements and a different timetable than MAP-21.
    - Includes pavement, bridge, ITS assets and culverts
    - Commission can set performance targets for these assets (goal is to make these targets consistent with the MAP-21 targets)
    - State targets apply to the state highway system – MAP-21 targets apply to Interstate & NHS only – different extents for different targets create potential for confusion
- Relatively higher percentage of locally maintained pavements on NHS than bridges (10% deck area is local vs. 40+% of pavement lane miles) - also, Caltrans does the majority of bridge inspections (exceptions are LA County, GGBT) whereas localities collect their own pavement data.
- California has large population of bridges in “fair” condition – important to keep these from dropping into poor – key to achieving targets.
- Comments on the MAP-21 measures and targets
    - SD not precisely the same as “Poor” for bridge condition
    - Over crossings not included in the bridge condition measures
    - No provision for “negative” targets – may be addressed in final rule
    - For pavement, rutting only considered for flexible – but in California rutting is also a concern on rigid pavements
    - Difficulty of collection
- Clarifications from Pete Stephanos (FHWA)

  - FHWA can make adjustments to the rule if these adjustments are logical outgrowths of the original rule. New items not related to the original need to be released as supplemental rules and go through a separate commenting process.
  - Noted that FHWA is looking at the IRI threshold for "poor" in areas > 1 million population – have received many comments on this.
  - FHWA must consider the comments it receives – heard the issue from California about use of PCI rather than IRI – NPRM does not allow for use of a PCI, but alternative approaches would be entertained.
  - Clarified that minimum 5% poor threshold for pavement applies to Interstates – had been presentation that CA didn't meet this threshold, but data was for NHS, not Interstate.
- ITS Assets – have target of 90% or better in state of good health (providing complete and accurate data, reliable access) – current varies from 66% good for vehicle detection systems to 89% for CMS
- Culverts – Have 205,000 culverts on the SHS, roughly 20 million linear feet of pipes. Implemented inspection program in FY06-07 – rate from 1-100. Currently 50% in good condition, 14% poor. Improvements funded by HM-2 ($7 million annually for repairs, maintenance) and SHOPP ($41 mill/year for rehab/replacement).
- LRS and FHWA Pooled Fund Study (PFS):
  - PFS involves 9 states including CA, FL, PA, GA, MN, and NM. Helps with strategic planning, data gap assessment, LRS development, data collection methods, improving processes for tracking and reporting certified mileage.
  - CA scope is to develop requirements and evaluate software solutions for maintaining the LRS. Looking at ESRI R&H, Intergraph and Bentley/Exor. Once Caltrans makes selection, will produce implementation plan.
- LRS/Road Network Questions/Comments:
  - Local agencies are storing and managing roadway data in different ways and at different accuracy levels – hard to stitch together
  - Potential MPO role – drive standardization across local agencies, serve as intermediary
  - Will tribal lands be part of the system? FHWA indicates that they are working with federal lands and intend to include in ARNOLD – New Mexico is a pilot for integrating federal land road networks.
  - Kern County has strong GIS unit – data based on Public Lands Survey. Single county COG – data holder. Just formed an Advance Planning Section, defining data needs.
  - San Juaquin County – small 2 person GIS group – not much interaction with Caltrans, but are interested in pavement condition, accidents, lane closure information.
  - Riverside County – have robust GIS – road network, pavement data. Have OTS grant to work with cities on accident data. Collaborate with Caltrans on project delivery – obtain state bridge and project data.
- CMAQ and System Performance

  - The Caltrans 2015-2020 Strategic Plan includes goals for reductions in NOx, diesel particulates as well as for improvements to system reliability on congested corridors and for tripling the bicycle, pedestrian and transit mode shares.
  - Caltrans uses PeMS for highway system performance monitoring – detectors are on the state highway system in urban areas. 9 of the 12 Caltrans districts have coverage.
  - CMAQ projects tend to be on arterials – and many off of the state highway network – would be helpful to have a data source that could be used to evaluate these.
  - There are no plans to add more detectors, but Caltrans hopes to integrate NPRMDS (and other) data to expand coverage. Also exploring Bluetooth readers. Work on Connected Infrastructure is in pilot stages and there are possibilities there for expanded information to monitor both vehicular and pedestrian travel.
  - Given that MPOs are required to set system performance targets for their areas, there was discussion about whether PeMS could be used as the primary monitoring tool for both Caltrans and the MPOs. Additional data needs include expanded coverage (e.g. using the NPRMDS or other sources), inclusion of transit data feeds, inclusion of information on vehicle occupancy (for HOT lanes), improved capture of motorcycle data.
- Freight
  - Discussion focused on the importance of a multi-modal perspective (MAP-21 focus is on the highway side), and the fact that there is an abundance of data but much of it is proprietary, and there is no national entity responsible for composing a unified view. Some useful work has been done in this arena (e.g. NCFRP Report 10); Caltrans is working on a statewide freight model.
- Safety
  - California has an integrated statewide traffic records system (SWITRS) that all state law enforcement agencies contribute to.
  - Caltrans is working on populating highway inventory elements to meet MIRE/FDE requirements and provide data for the HSM SafetyAnalyst and IHSDM tools – target completion is September 2020.
  - Possibility of setting up a single data repository with distributed data collection/updating responsibilities. Still needs discussion about what elements will be included, where the data would be stored (and relation to the HPMS database), what software would be available for the distributed update process, and who would manage this process.

Proceedings

The following sections capture the presentations and discussions held during the two-day workshop.

Introductory Remarks

Malcolm Dougherty (Caltrans)

Mr. Dougherty expressed appreciation to attendees for their participation in the workshop and to the FHWA representatives for their attendance. MAP-21 requires establishment of performance measures so states can provide metrics on outcomes of federal spending. Three areas of data: Safety, Physical Condition of Infrastructure, System Performance. This 2-day assessment workshop is to assess how ready California is to meet these requirements, and understanding current status of data collecting efforts, resources, and gaps. How will metrics be measured? How will we set targets? What will penalties be if targets are not met? How can we manage data and use for decision making? How will we collectively set these targets? How will we measure these in a consistent way? How will we measure, what targets will we set, what are implications of meeting/not meeting those targets. Additionally, there is a need for consistency in data between State and local agencies.

Giles Giovinazzi (Caltrans)

In the weeks leading up to this, Caltrans posted fact sheets, a performance measure data matrix, and an anticipated rulemaking schedule among other information to its MAP-21 implementation website (http://www.dot.ca.gov/hq/transprog/MAP-21/MAP-21_implementation.htm).

The primary Federal rulemakings outline performance setting processes for three areas, Performance Management 1 (Safety), 2 (Physical Infrastructure), and 3 (System Performance). A June 2014 NPRM outlines how these targets should be incorporated into State and Local transportation agencies.

- First Safety performance measure expected to be posted later this year; Caltrans will have one year from effective date to comply (effective date may be later than publish date) and MPOs must set their targets within 180 days of Caltrans. States must adopt and use model (MIRE FDE) to advance Safety analysis. The estimated cost is $1.4 million to complete initial, although Caltrans believes cost will be significantly higher.
- For Physical Infrastructure, Caltrans must set bridge/pavement targets within one year of final effective date; expected to be published in December 2015. State DOTs must establish baseline conditions, a 2-year (midpoint) and 4-year (full performance period) targets; MPOs would establish 4-year targets for the same measures within 180 days after State DOTs establish targets.
- System Performance (Freight/CMAQ/Traffic Congestion); NPRM publication expected late-October 2015 with comment period ending late-January 2016.

Discussed next steps: Caltrans will submit comments on proposed rulemakings, and solicit input. MAP-21 owners will rework action plans, identify policy issues/decisions, and develop process for setting performance targets.

Vince Mammano (FHWA)

Mr. Mammano discussed how he re-organized his office to focus on performance measures, and acknowledged Aimee Kratovil and Wesley Rutland-Brown who were in attendance from his office. Reiterated that the MAP-21 legislation is about strengthening the nation's public transportation system, creating jobs, promoting an aggressive safety agenda, and simplifying and consolidating Federal aid program. California is a trend setter in addressing many of the MAP-21 items, although data is the biggest challenge (how we collect it, who collects it). The purpose of these workshops is to work together to set goals; FHWA is not dictating the goals you must hit. Reiterated this is an early stage of MAP-21 and this is attendees' opportunity to help shape it. Members of FHWA headquarters in attendance to hear the challenges in California and take feedback back to Washington.

Peter Stephanos (FHWA)

Mr. Stephanos reviewed the MAP-21 performance framework, status of MAP-21 implementation and associated challenges, and discussed the Highway Performance Monitoring System (HPMS) and National Performance Management Research Data Set (NPMRDS).

- Framework: There are six MAP-21 performance elements: National Goals (seven), Measures, Targets (to be set by state and MPOs), Plans (how to achieve goals), Reports (how to report on progress) and Accountability (limiting flexibilities on how to spend money). This will be transparent; website will have all information, including progress reports to Congress. There are nine rulemakings (six are FHWA; five have been proposed so far). A guidance document will be published for comment on National Transit Plan that will establish safety criteria. Nearly all nine are significant rule makings (which means multi-step process involving many agencies before getting rules out). Safety Performance Measures proposed rulemaking received approximately 14,000 comments.
- Implementation challenges and opportunities:
    - Providing both consistency and flexibility: Want to strike a balance between consistency and flexibility so data are consistent but organizations have flexibility to set own goals.
    - Finding the right balance of National measures: Trying to establish a thin layer of national performance measures, but not down so far that it is too deep. Want outcome measures that provide guidance in how to spend and improve, but not so far that agencies have to create responses that do not make sense.
    - Managing performance across jurisdictions: As an example, the Mid-Atlantic region/Philadelphia urbanized area, which crosses New Jersey, Delaware and Pennsylvania, with overlapping transit jurisdictions. Collectively, their investment making decision in Philadelphia area influences outcomes across boundaries/areas of responsibilities. Getting all those jurisdictions together on target setting, data, etc., is a tremendous opportunity, but also a tremendous challenge.
    - Data requirements and management.

  - Linking performance measures to investments: Want to link performance measures to investments; as we get more and more information on investments and if those work or not, the Federal agency will be able to deploy best practices to achieve better results.
  - Advancing technologies: Using a slow rulemaking approach means technology may be outdated by the time it is implemented. Want an approach that allows for new technologies to be incorporated.
  - Another challenge is reporting progress at the Federal level.

- Reviewed proposed required HPMS fields for interstate and non-interstate pavements: Seven key fields in HPMS proposed for use in calculating pavement measure (condition metrics and inventory elements). Proposed some changes to frequency/extent/duration of data collection (two directions instead of one, and yearly, not every two years, moving from sampling to full extent). Many comments received, FHWA is looking at how to respond and incorporate.

  FHWA is proposing to make two determinations for state:

  - Have they met minimum condition requirements? If not, they are required to focus their National Highway Performance Funding on those systems. (Data due June 15th)
  - Did State make significant progress toward their targets (which they set themselves)? FHWA will assess, did they meet their targets or get close enough, and FHWA will make a determination/finding (ask for additional progress reports, ask that more funds be directed to area, e.g., safety). (Data due Aug 15th)

  HPMS has a report card for reporting timeliness (how many states respond by date), completeness (whether data are sampling or full extent), quality (how good is data, are there minor or fatal issues).

- NPMRDS: We should leverage existing data sources as much as possible; there are existing databases for safety, pavement, and bridge (available to states and MPOs at no cost). For other areas, there are no existing national databases. There is a quarterly webinar where agencies can learn more about NPMRDS. Additionally, there are monthly updates (with data from last month, not real time).

  Applications and use of data: Data is used to track trends, evaluate improvements, inform investment decision making and used for storytelling. There are no predictive values in the data, it is all raw reporting.

  Additionally, FHWA made public notice they intend to collect implementation data, required to report to Congress on how States/MPOs are implementing these requirements. Intend to send out a survey next year to get baseline information.

Q&A

- Malcolm Dougherty: How do local agencies account for factors beyond their control (e.g., distracted driving) when setting targets?

Peter Stephanos: In setting targets and reporting progress, states will have the opportunity to tell a story in addition to just reporting data, so state can provide what they considered in setting the target, and in the progress report can also explain deviations and circumstances outside of agency control.

- Daniel Landon (Nevada County Transportation Commission): Why are we moving forward with only IRI (and not PCI, currently used by many local agencies)?

  Peter Stephanos: Final rule is not out yet. Many comments from local agencies indicated they don't use IRI, or IRI use is minimal, or not feasible (signalized roadway); next step is for FHWA to respond to comments and make final rule, and those response will include why they accepted or rejected comments.

- Mike Duman (FHWA California Division): As we look at developing these targets and infrastructure improvements, many are many years out, not overnight. As conditions change, biggest one is funding levels. Is that included in ability to say they're making good efforts? How is that discussion planned?

  Peter Stephanos: Safety targets are 1-yr, Pavement and Bridge are 2- and 4-year targets. Tried to set short timeframes. Also proposed when you set targets, you set them as incremental steps towards a long-range plan. Received comments that target setting are too short (need a decade, can't move needle in 2-4 years), or targets are too long (10 yr for asset management was too long of a target).

- Patricia Romo (Riverside County): Shouldn't agencies be given flexibility for timing of targets?

  Peter Stephanos: Most requirements for funding are statutory (meaning only Congress can change requirements). MAP-21 does add some flexibility previously unavailable.

Dave Vautin (Metropolitan Transportation Commission)

Provided a case study (the Vital Signs Initiative in the Bay Area, an interactive performance monitoring website, similar to needs for MAP-21) about using data to tell a performance story. Shared lessons learned from Vital Signs Initiative as applicable to MAP-21. Target setting process will be tough even with the best data available. State DOTs and MPOs need to think of how to integrate MAP-21 requirements into existing data collection, and need to consider economies of scale – be sure the right organization is collecting data at the right level (State vs. MPO). Data collection requires expertise in many different issues, and agencies are dependent on state and national data sets because local MPOs do not have funding to collect all data; comparisons to other metropolitan areas were only possible because FHWA had that data. More effort should go into communicating findings to the public.

Q&A

- Peter Stephanos (FHWA): Have you documented the procedure used to gather this data?

  Dave Vautin: We do have documentation of performance measure methodologies, but have not updated the updating approach. Expected over the next 6-12 months.

- Matt Friedman (Caltrans): How often do you anticipated updating data?

Dave Vautin: Expectation is every 1-2 years, depending on data set.

- Alex Estrella (San Diego Association of Governments (SANDAG)): What's the level of effort on building and maintaining the system? Do you host it internally?

  Dave Fautin: Had 2 FTEs over one-year period for planning, data work, analysis, narrative, build out. In terms of website, had consultant support. Up front cost was $150k to build out website, cost of maintenance should be a lot lower (approx. $25k/year). Hosted on a third party, collaborated with a startup because much more nimble versus an big firm

- Elisabeth Hahn (Stanislaus Council of Governments): Does the $150k cost include staff or just website?

  Dave Vautin: Just website. We could do a lower cost, if you use existing system (such as Tableau) can publish data to the web. Less quality in terms of slickness, graphics, but easier to get data out cheaper.

- Jerry Barton (El Dorado County Transportation Commission): What funding source does MTC use for this?

  Dave Vautin: For start out work it was general fund, going forward its STIP (state transportation improvement program) PPM (planning, programming, and monitoring) funds.

- Joanne McDermott (Caltrans): Any freight-focused data or performance measures?

  Dave Vautin: Ended up reporting freight movements at seaports and airports specifically. We found freight resources didn't meet requirements for vital signs measures, so stuck with ports.

- Brian Travis (Caltrans): Is MTC going to promote automatic vehicle locators, passenger counters, to integrate with other data we have?

  Dave Vautin: A lot of our operators already have data, number of transit agencies only have it on part of their fleet. There are some gaps there, but some improvements going on. Existing data useful for passenger counts and reliability, but surveys are important too.

Dan Landon (Nevada County, Rural Counties Task Force)

Two years ago, FHWA hosted a MAP-21 workshop in Sacramento; Mr. Landon reported on what rural counties have done since that workshop. Rural Counties Task Force identified system preservation as a key issue, worked with a contractor to develop a report of Rural Counties Local Roads Needs Assessment in 2014. Project objectives were to compare revenues received vs pavement needs, look at 3 funding scenarios (preventative vs worst-first), also made comments to the MAP-21 process related to pavement maintenance. Found that rural counties are a little behind the state average in PCI. Also found 10-year needs where money was needed are bigger in metropolitan areas, but on a per capita basis the rural needs were much higher. Illustrates need to normalize data. 20 year analysis to meet target PCI. With existing funds, will drop even further. To reach target, estimate need of $7.3 billion ($4.2 bil shortfall). In terms of performance measures, they need to be meaningful, repeatable, and economical to collect. PCI measure of pavement distress is widely used in CA and nationally. IRI (roughness) is not common on local roads, not appropriate for many rural roads.

Rural Counties commissioned a study based on SANDAG study of June 2013 to evaluate performance monitoring metrics. RCTF looked at MAP-21 performance measurement goals, and came out with performance monitoring indicators (9 potential indicators). Existing state tools are not consistent with each other, do not provide consistent side-by-side comparison, tend to favor urbanized applications over rural (as found by study commissioned by RCTF). Data sharing is a 2-way street: State relies on locals to update samples, Caltrans publishes VMT estimates based on those samples. Data collection and monitoring is resource intensive – needs to be a partnership. RCTF is committed to partnership with state and feds.

Q&A

- Brian Travis (Caltrans): Was transit data collected for TDA?

  Dan Landon: That is the basis in the rural areas for the transit guidelines.

- Jan Smith (Trinity County): Going through STIP performance measures, we notice they talk about reliability on statewide basis is congestion. In rural area, reliability means "will road be there or not?" due to mountain erosion, etc. Would like to find a way to capture that in performance measures.

  Dan Landon: Great comment; echoes what RCTF found in their performance indicator study.

Asset Management

Michael Johnson (Caltrans)

Next portion of workshop focuses on physical asset performance and the requirements therein. Provided a definition of asset management and overview of the requirements and scope mandated by Federal (MAP-21) and State (CA Government Code 14524) laws. Discussed penalties associated with these laws and the plan for implementing the asset management program in California.

Pavement

Tom Pyle (Caltrans)

Mr. Pyle introduced Jesse Bhullar (Caltrans) who was in attendance to help address questions. Reviewed existing pavement measures (which differ at the State and Local levels), and explained the proposed measures – and thresholds – under MAP-21 (IRI and cracking for all pavements, faulting for jointed plain concrete pavements, rutting for asphalt). Indicated that while currently Caltrans is interested in IRI and locals are interested in PCI, with MAP-21 both State and Local need to be concerned with IRI. There will be new criteria brought upon local agencies, and we will have to ensure that all data is submitted in the same format. Discussed the gaps in how data would be collected, explained how conditions would be measured, and reviewed proposed reporting timelines and penalties. As of right now, Caltrans would not meet proposed guidelines. Caltrans does not have this information for Local Agencies or for sections more than one million in population.

Bridges

Mike Johnson (Caltrans)

Total inventory in California is 24,690 bridges (90% State, 10% Local); most bridges are state/federal and large (e.g., Bay Bridge) but the challenge is there is a big disparity in terms of area. Bridges must be inspected once every two years; when those bridges are assessed, they are rated on a 0-9 scale (0-4 poor, 5-6 fair, 7-9 good) in the areas of Deck, Superstructure, Substructure, and Culvert. MAP-21 not necessarily a "worst first" approach – realistically need to look at "fair" band to keep those from falling to poor.

MAP-21 performance measure trend since April 2015: Poor staying same, Fair going down, Good going up. Based on data available now, State is not comfortable setting performance targets. NCHRP reports talk about target setting; first we need to look at fiscal constraints. Question for FHWA: Are our targets fiscally constrained or unconstrained? In 1994 California started doing element-level inspection for bridges, which are significantly more detailed than performance measures proposed in MAP-21. There is better data available, but we're not using it for the performance measure.

Culverts

Parviz Lashai (Caltrans)

MAP-21 requires pavement and bridges. However, State system mandates culverts and ITS as well. California code requires a 5-year maintenance plan for culverts, and a 10-year SHOPP plan. Required to show drainage needs. In order to address those requirements, Caltrans implemented Culvert Inspection Program (CIP) started FY 2006/07. Used BCP to fund program initially. After Caltrans inventories the culverts and assesses their conditions, use a couple of programs (HM highway maintenance and SHOPP) to address the drainage needs of the state.

Estimated 205,000 culverts (20 million linear feet of drainage pipes). Average annual inspection rate is 12,000 culverts (1.2 million linear feet). For data collection on culvert inspection and assessment, collect: GPS coordinates, District, County, route, Material type, # barrels, Size, length. Other factors – hydraulics, drainage adequacy, condition of pipe, design capacity of pipe. Rate from 1-100. Typical problems: debris in culvert, cracked, joint separation, rust, backfill infiltration. Based on inspections to date (currently 50% of inventory), 60% good, 26% fair, 14% poor.

In order to address those, Caltrans has a couple of alternatives. If in Fair condition, use HM2 (highway maintenance) to fund preventative/corrective maintenance (cleaning out culvert, re-grading channels, lining, patching, repairing, replacement). For drainage rehabilitation/culvert replacement, addressed through SHOPP program ($41.7 million/year budgeted for this). Includes replacing culvert, pipe lining/ramming.

Other issues: Fish Passage (state mandated) – there are about 569 fish passage locations statewide. When working on culvert maintenance, need to address fish passage at same time (unable to replace projects that block fish passage, must ensure new construction does not prevent fish passage, etc.). As they work on existing, must be brought up to code.

Goal and Prioritization: Safety & health; stewardship & efficiency; sustainability, livability, economy; system performance; organizational excellence. Goals are to assess 12,000 culverts per year, use CIP database to prioritize funding of projects, address fish passage needs.

At current rate of inspection, and current status of 50% inspected, Caltrans estimates another 8 years to finish first round of statewide culvert system inventory. Not a desirable rate. If Culverts was to get more resources, would expedite that schedule and get full inspection of state culvert system. Based on trends in last few years, percentages of good/fair/poor have stayed consistent (don't expect big shifts in percentages). Estimate if given $450 million/year for next 10 years, could achieve goal of 90% good culvert system.

Intelligent Transportation System (ITS) Elements

Brian Simi and Matt Friedman (Caltrans)

Mr. Friedman introduced Thomas Schriber (Caltrans Strategic Management Plan).

The intent of ITS is to improve efficiency of existing facilities (funding is becoming restricted for expanding, so want to maximize existing roadways). Less costly than major construction. Also a cost effective means of managing traffic. Discussed Caltrans' strategic objective to efficiently manage transportation assets by implementing the asset management plan, embracing a fix it first philosophy, and corresponding performance measure to measure ITS elements health, system operability, and equipment workability with a target to, by 2020, maintain 90% or better ITS element health (SB 486 requirement). Described the three major ITS elements mandated by SB 486, Vehicle Detection Stations (VDS), Ramp Meters (RM) and Changeable Message Signs (CMS). For VDS, data is analyzed in Performance Measurement System (PeMS); introduced Tim Hart from Caltrans, Sandra Lennie from Iteris, Inc. (a consultant partner). Data is used for travel time analysis. Caltrans has approximately 4200 VDS. Ramp metering: Caltrans has over 2700 ramp meters to regulate flow at which vehicles enter main highway. Prevents clumping of vehicles. Ramp Meters have been found to reduce delay by 30% in congested corridors. Very cost effective way of maximizing movement on the main line. CMS provide traveler information. Offer projected travel times (10 minutes to Bay Bridge), also road condition alerts, safety reminders, Amber alerts. Caltrans has 815 CMS. Has an approval process for messages, wording. Described the current definitions for ITS asset performance (Good and Poor) and approximate current performance. Good performance for ITS means providing complete and accurate data and reliable access. Poor performance would be incomplete/inaccurate data, lost communication with device, needs repair, or is obsolete.

Asset Management Q&A / Discussion Notes

- Majid Sarraf (TTG Corp): With MAP-21 we are changing bridge inspections and the methodology for how we rate bridges, I'm afraid we're going to be missing the reality that the physical condition of bridges has not changed. Can you address that – and how we will work together?

  Mike Johnson: With respect to change in inspection protocol, it's defined in MAP-21 so we don't have a lot of say in national requirements. Caltrans is audited annually by federal highway administration to be sure we are strictly adhering to those national bridge inspection standards.

From a personal perspective, new inspection requirements are substantially better than anything we've had before for bridge inspection. Better data will always lead to better decisions. How we can work together? With respect to bridge condition, Caltrans does the lion's share of it in CA and on the one hand, that's good because there's consistency, but on the bridge reports produced now it says "in accordance with MAP-21 we're changing the inspection protocol, which may result in different ratings" meaning there is no physical change to bridge, but criteria have changed and placed it in a different rating.

Peter Stephanos (FHWA): Note about the rulemaking process – we have proposals out there, get comments, take info from comments, see if we can address comments in final rule. There is a test they have to pass to make changes; has to be logical outgrowth from proposal or comments. If it's a completely different approach, can't continue with original (have to have a supplemental proposal). They are looking at where there are a lot of comments saying "you got this completely wrong, need a different approach."

On pavement standards, they have standards for rut depth, etc., in the proposal. If you have any questions or comments on that, you still have time.

The 1M population threshold for the IRI level, they have received many comments and they are looking at that in terms of the impact on local agencies. They do have ability to propose a separate target for a certain area of state, different than the statewide target.

On the pavement condition, did you mean NHS or Interstate on 7%? The 5% proposal is just for interstate.

Tom Pyle (Caltrans): The 7% was for NHS.

Jesse Bhullar (Caltrans): I wouldn't call that the average; it's only IRI.

On the ITS presentation, the good/fair/poor and detectors was one of them. The detectors percent poor was pretty high (approx. 35%). Is Caltrans looking to replace those detectors or go to a different approach that doesn't require detectors?

Brian Simi: Yes, we are looking into both, there has been wire theft in the collectors. We are looking at alternative data sources as well to minimize our risk across the board.

- Alex Estrella (SANDAG): Is there a plan to reconcile IRI with local agencies? Right now local agencies focus on PCI. Is there something we need to consider as we go back to local folks?

  Mike Johnson: The way the notice of proposed rulemaking is written we did not have an option for PCI, although that was a comment Caltrans submitted. Many locals in CA also submitted information saying switching to IRI was going to turn softwares/systems upside down in MPOs. At this point, we don't have a lot of option there. If final rule gave that option, we would try to work that out.

  Tom Pyle: In terms of PCI and IRI, there are some ways to do a rough correlation between the two but in terms of the submittal, it must be an IRI submittal. We have not seen a conversation where the submittal could be translated from PCI into an IRI, the IRI needs to be collected.

- Peter Stephanos (FHWA): We heard from the comments that for the locals who use PCI, there isn't a smoothness indicator, so this is something different entirely. We heard that; we are considering. What we didn't hear was "Hey, we've got an alternative approach that maybe you could correlate from PCI to IRI, would you consider that?" If we get a comment like that, we have to consider it. If we don't get a comment like that, if we come up with it on our own, we have to issue a supplemental proposal. To the extent you can, please let us know through the comment process so we can consider it through those channels.

  Mike Johnson: I know what Caltrans comments were; I don't know what the local agency comments were. Did any agency propose such a conversion?

  Margot Yapp (NCE): No we did not propose a correlation. I know some agencies have tried to do some correlation between PCI and IRI and were not able to. Many local agencies are not asking for correlation, they are asking for PCI to be used.

- Mike Johnson: Question to you, MPOs, we (Caltrans) have to propose targets – how would you propose we do that recognizing that the State and local agencies must meet these targets. We're told to engage our local partners, and here I am asking you. There are statutory timelines under MAP-21 and CA code where we have to produce something that represents a combined target and I'm struggling with how to do that, how to reach consensus with 18 MPOs and many RTAs.

  Jesse Bhullar (Caltrans): On the pavement side, I have this question for locals. As you heard, requirements are for all NHS roads to collect IRI, faulting, cracking, rutting. What are your thoughts on that? Would you like to do it on your own? On the Caltrans side, we are collecting this information, so there is the possibility we can help you out but we don't know your thoughts on it and what you want. Would you like us to help you with it or would you like to collect it on your own?

  Alex Estrella (SANDAG): The answer is I don't know; we don't collect pavement data, we're measured on the performance side. One of the things I've learned working with local agencies is that PCI is their methodology so it is going to be a huge gap on our side because they have different methodologies and different systems. In the printed packet there is a table matrix, for the first reporting period there is going to be support from Caltrans, that will be very helpful. How do we establish performance targets? I have no idea. We may have a good idea regionally but I don't know how that plays out on the State level.

  Mike Johnson: An academic answer on how to set targets is consider budget, draw on experience, look at history. Scratch the look at history (we don't have any). So we have to look at budget, draw on experience, and look at risks that might be out there. I think in the short term, Caltrans already has a contract in place to collect all the info needed for MAP-21 for a two-year period. So local agencies have a pass for two years. When we look beyond that two year period, from a Caltrans perspective, there are options. All the locals could collect their own and we could coordinate collection of that (seems nightmarish – data has to be just right). But we are sensitive to State coming in and collecting data on your system that you are not a part of. Collecting data from one source makes the most sense. Some of these groups that will be

submitting data might just have one mile of reportable pavement, and they would have to hire resources to go collect data. Others are large agencies that have resources. But then Caltrans gets a mixed set of data from all over. Need to have data collected consistently, has advantages from Caltrans perspective, but they are sensitive to not steamroll the locals.

Elisabeth Hahn (Stanislaus Council of Governments): Previously worked with National Parks Service, they have agreement in place where FHWA collects data and has a sophisticated database to help Parks determine how to do preventative maintenance. As a small county with not great data collection, would love to take that back to management with Caltrans help being a positive.

Margot Yapp (NCE): For some areas, IRI not practical. Eureka has 1 – 1.5 mile on NHS, but nearest contractor is going to be in Sacramento – cost of mobilization is more than cost of collecting data, that's one of the hurdles to using IRI. Orange County uses PCI to determine funding for improvements, works well for them. From the locals point of view, to adopt IRI on less than 5% of the network is a financial burden. After the two-year collection period Caltrans is paying for, will local agencies be saddled with cost? How will that affect?

Mike Johnson: Caltrans is also talking about what happens after the first two years. We didn't want to come off presuming locals wanted us to do it for them. Eureka example is perfect – we have a van traversing the roads up there, so it's more efficient for our State van to detour and measure the local road while they are already there. Efficiencies of scale to do one contract and measure all roads.

Tom Pyle: Right now, current contract is a two year $7million to collect Caltrans network as well as NHS system, by the end of October we will have the entire state collected. By January we will have the entire NHS off system of cities and counties collected as well. And then we start over. Department is moving into a very structured cycle from Jan-Aug. We did not want to presume you wanted us to collect data, we just know that we are responsible for submitting data and it has to be correct with all the data in the proper place. We will offer everything we have to those who ask (data dictionaries, linear referencing system, etc.). It's a big process and we have a dedicated team, but how it comes about is a big part of this.

Jesse Bhullar: In summary, we are doing it on the state highway system, we can do it on the NHS, but we need input from you and there is a cost element to it. But the economies of scale make it more efficient. But we need to hear from you.

Pete Wroblewski (Santa Barbara County): First two years, Caltrans will pick up cost of evaluating?

Mike Johnson: Yes.

Pete Wroblewski: I agree that makes sense. We have a pretty good data collection system for PCI. We'll continue to get that. Our consultant that measures PCI for us has the capability to measure IRI for us as well, but I don't think we'll want that on the rest of our roads because we have a system in place that makes sense for us. It would be an independent IRI measurement

just for the required roads. Using Caltrans contractor for those two years makes sense. Then, if need be, we can take over in two years and replicate the Caltrans process.

John Harvey (UC Davis): Even Caltrans has issues with IRI on highways that are stop/start/low speed. It's a technology gap I've kicked over to feds. My question is, regarding PCI, one of my concerns is if you're calculating PCI different between street saver, micro paver, I don't think you have a consistent measurement. I think you are getting your cracking and other measures, and I think you could report those things.

Peter Stephanos: Whether a local agency has fringes of NHS or a pretty good chunk, the timing we have for implementation in the proposal is that it would start Jan 1, 2016. Likelihood of having a final rule in a month or two is very unlikely, so you can expect that implementation to be shifted, so there is some time. Also, for the non-interstate NHS, we had a phase-in of two years. So for the first two years after the implementation starts, the new measure doesn't kick in until after the first two years. So if you're already collecting two years of data using proposed approach, local agencies will continue to collect PCI, then you have an opportunity to look at the two data sets. Maybe outside of IRI there is a correlation between cracking and rutting and PCI, or maybe they are very different and there is a problem. Look at it as a learning experience and maybe do some other studies to find opportunities for correlating the two different sets.

Jesse Bhullar: Since we did not hear from every local agency, let's take a poll of the audience. Which local agencies in attendance would be in favor of having Caltrans collect data for the first two years? Many (approx. 20) hands raised. Any local agencies opposed to having Caltrans collect? No hands raised.

Rajeev Seetharam (Southern California Association of Governments (SCAG)): In terms of data collection, once you do the initial stuff maybe there is every two years needs survey, ask agencies if they want to collect data further.

Mike Johnson: That's a good suggestion. There are 200 agencies that could collect their own data. From our perspective, it's a puzzle, trying to piece it all together in terms of GPS coordinates and that's a nightmare. It's extremely difficult. To us, that might be more effort (compiling data) than just to go and do it ourselves. Not that we want to go collect all this data, but the alternative is unpleasant.

Frances Harrison (Spy Pond Partners, LLC): The data part of this seems relatively straightforward to solve; it makes sense for Caltrans to collect the entire NHS potentially with an option for an agency with a lot of miles to do it themselves. That's the easy part. The hard part is resources allocation, target setting, we have fairly established policies in the local agencies using PCI. One can speculate how hard it would be to shift, I think it would be difficult. That shift is the harder part of this puzzle to me.

Mike Johnson: I was not aware Peter said we can set different State and Local targets.

Peter Stephanos: Proposal is to set a statewide target for NHS that includes all roads (state and local owned). In addition, you can set targets for particular parts of the state. The example you

showed for bridge conditions, you might have additional targets on those. We (feds) would only assess your progress on statewide target.

Mike Johnson: When you say statewide, you mean an aggregate target for State of CA that could have two disparate targets beneath it?

Peter Stephanos: Yes.

Risk Management

Shanna Everts, Eric Strader (Caltrans)

Goal of the next hour is to find out if local partners have risk items that would prevent us from achieving a statewide goal. Two objectives for exercise: (1) identify threats and opportunities inherent to implementation of risk based asset management plan; (2) identify risks to NHS condition, effectiveness, system performance.

(Facilitators divided room into 4 groups, 3 tables a piece. Each group was assigned one of four "table topics", which were listed on posters hung around the room. Each group of tables had one facilitator from Caltrans Enterprise Risk Management group.)

Table topics were:

1. Risks inherent to the development and implementation of a risk-based asset management plan.
2. Risks affecting assets in the plan, including NHS condition, effectiveness, and system performance as it relates to the operation of its physical assets.
3. Risks to assets evaluated pursuant to 1315(b) of MAP-21 because they have required repair and reconstruction activities on two or more occasions due to emergency events.
4. Processes of risk assessment, evaluation, prioritization, and mitigation.

Tables sent one representative up to share outcomes of their discussion.

Table 1 (Topic 1): Discussion around parameters, needs of risk-based asset management plan. Also debated quite a bit on the if/then statement, should it be negative or positive. Ended up with a positive. If a risk based asset management plan is thoroughly developed, then Caltrans will have a defined focus of where to devote resources to maintain the highway system.

Table 2 (Topic 2): If you implement ramp metering sporadically, then the end result is that people will avoid that ramp meter and cut through local traffic, affecting local conditions.

Table 3 (Topic 3): Legislation, types of legislation (environmental or other policy type things), might have to do additional studies which adds cost and time.

Table 4 (Topic 3): When emergency events occur repeatedly in the same area, it can be an opportunity to implement new technology or new designations for routes. But can also be a threat if you need to address it immediately, if routes cannot be changed.

Table 5 (Topic 4): A major risk is if we don't have performance prediction models, we're always going to be playing catchup during project delivery and development which leads to increased cost between project approval and completion.

Table 6 (Topic 4): If you miss a risk (climate change), you could be making decisions not based on latest info. Another one, lack of buy-in to risk-based approach could lead to risk-based plan not based on all risks.

Table 7 (Topic 4): Sometimes it is easy as an asset manager to think about system and not political climate. As an MPO, we have many stakeholders we don't want to alienate. If you fail to get input from constituency and public and different organizations, when you come up with strategies for mitigating risk you risk alienating certain constituents in your area and it becomes a political problem.

Linear Referencing System (LRS)

Mark Samuelson (Caltrans)

On Day 1 the focus was on infrastructure, pavements, culverts, ITS and data; we need to bring all this information together and look at it as a whole (i.e., look at one stretch of roadway and see all the data). To help facilitate this we are starting a LRS.

This workshop is our opportunity to solicit comments from local agencies for the system development plan. Ultimately, we are looking for collaboration opportunities for LRS maintenance, to make sure we do not make a design decision for Caltrans that is problematic for California as a whole and the final item is to understand any functionality that is needed on a statewide basis. Today's objective is to conduct a high-level, statewide assessment of anticipated LRS requirements and to investigate and promote collaboration opportunities for future use of the All Roads LRS Network.

Currently there is a two-phased system development plan for the LRS. First, a System Development Plan/Feasibility Study Report that can be used to acquire, implement, and maintain a long-term LRS solution that meets Caltrans business requirements as well as state and federal requirements. The second phase is implementation.

Joe Hausman (FHWA) discussed the significance of LRSs and provided a brief overview of the ARNOLD project.

Greg Yarbrough (Data Transfer Solution) provided an overview and status of the project. Primary goal of LRS project is to begin to gauge interest of MPOs, counties and local agencies in sharing data back and forth with Caltrans to support the ARNOLD initiative, and also eliminating duplicative efforts in terms of data collection and data management.

Currently, project is in Task 2, looking at software alternatives for Caltrans. Caltrans will decide which system is most appropriate to serve them at the enterprise level, and also to serve the local stakeholders from this point forward. Once that decision is made, next task is to develop a plan for implementation.

John Wisdom (CDM Smith) discussed detailed requirements for an LRS system, including technical capabilities.

Greg Yarbrough then discussed different scenarios for supply chain patterns: 1) local agencies supply geospatial data to DOT, 2) third party vendor collects data and compiles it for DOT, 3) a hybrid approach of both, or 4) DOT compiles all info itself. While the first option is ideal it is not always feasible; which is what we are currently trying to figure out for California – is this possible at this stage in California? There needs to be a mutually-beneficial exchange of information between local agencies and Caltrans. A few weeks ago, we sent a local stakeholder survey (10 questions). To date, received 21 responses.

Discussion of survey results. How agencies create centerlines, how they are updated, etc. Most local network accuracy is in the 10 or 10+ foot range. For ARNOLD, most States LRS are looking for 5 foot accuracy. We're finding that a lot of data being used at the local level does not meet the requirements at the federal level. As the LRS is being built and accuracy improves, could be useful to locals to improve geometry of the network you're using at the local level.

There are a variety of ways agencies are currently referencing their data. That's an issue if you're going to build a statewide network and have locals submit their data up to the state level. There was very high interest at the local level in receiving data from Caltrans. How many of you actively work with Caltrans to request data? Few (1-2?) hands. Example (Glenn County Transportation Commission): post-mile information, other things not road related, also regional view of multiple counties, survey information we don't have related to state highway system. Few people in the room currently interacting with Caltrans for info, but survey results indicate many are interested in pursuing that.

Are any of you at the local level providing data to Caltrans?

- Jennifer Mercado (CHP): We supply crash data, Traffic Collision Reports (TCR), processed and transmitted via paper to Caltrans. Caltrans currently takes mile marker for loss of control, not actual crash site. Need to keep that in mind in moving to LRS.

Observations from survey – data varies in accuracy, and variety of sources and methods of collection. That's why want to move towards a standardization.

There is a strong interest in receiving data from Caltrans, but only a moderate interest in sharing data with Caltrans (issues are resources – funding/staffing, as well as data issues such as IRI/PCI).

MPO representatives? Do you interact with counties, do you help them in terms of building their networks, is there standardization? One of the things we want to look at is the potential of using MPOs as an intermediary for gathering information. MPOs gather from counties, they submit it to the State. Can you comment on that?

- Seth Scott (Fresno Council of Governments): We have a single county jurisdiction, so most of data is being taken care of on county level and we receive it from them.
- Alex Estrella (SANDAG): We interact with different counties and cities (traffic engineers, public works directors) we work with them, get feedback.

  Greg Yarbrough: Are you stitching networks together?

  Alex Estrella: We use a geo-referencing system.

Greg Yarbrough: Are you interacting with Caltrans?

Alex Estrella: We want a little more information on the operational side. From a local perspective to meet our functionality needs.

Greg Yarbrough: Is there any specific info you'd like to see?

Alex Estrella: As we go through the workshop, obviously seeing the slideshow where you provide functionality from larger perspective, I think that's a discussion we need to have at the local level to provide that context.

- Julio Perucho (Santa Barbara County Association of Governments (SBCAG)): We start with national highway network, integrate project information using geo-referenced datasets. We vet projects through advisory committees. We share with District 5 Caltrans. They are relying on us to supply them with GIS networks. This is project information within county-wide transportation network.

  Greg Yarbrough: You're using national highway network NHPM, but it doesn't have local roads. Are you stitching that together?

  Julio Perucho: We are looking at local roads, we use aerials. But again, there is generalization since it's at an MPO level. We calibrate the models but not to intersection volumes.

- Rajeev Seetharam (SCAG): We are a six county region. We work with county transportation commission. When there was a primary freight network, we jointly have a freight collaboration in So Cal region. One thing we noticed was they used HPMS data for primary freight network, but data was outdated. Crucial data and volumes were missing. We jointly work with all county transportation commissions and Caltrans HQ and also we have a robust modelling division.

  Greg Yarbrough: There was missing info from geometry, were those local freight connectors?

  Rajeev Seetharam: It was more on the interstates, freeways.

- John Wisdom (CDM Smith): In New Mexico, we're looking at Tribal information to incorporate into the all roads network. We work with Parks, Wildlife, Corps of Engineers.

  Greg Yarbrough: Idea is to use New Mexico as a pilot for integrating those federal networks they are maintaining.

Greg Yarbrough: Counties who work with Caltrans?

- Yolanda Alcantar (Kern County): Yes we've had our GIS system for 10 years, based on public lands survey. Our COG is very good, they are the data holder for the county. Our GIS went through them first. We request Caltrans post-mile marker, classification information. We just created an advanced planning session, we are looking at what data we want.

- Mike Selling (San Joaquin County): We don't have much interaction with Caltrans at this point, and our COG doesn't have a lot of GIS capability. We have a couple of talented GIS folks and pulling data from other sources, and we manage our own data. The pavement conditions and accidents would be of interest to us, but it's really CHP when they do the reports, they need some training on identifying locations of accidents. We'd like to know where Caltrans have project work scheduled, maintenance, lane closures and route closures would be fantastic. A lot of times traffic is diverted but we don't hear about it until people complain to us.

  Greg Yarbrough: That is a requirement of FMIS 5.0, to map those projects.

  Mike Selling: Even upcoming projects; we're scheduling work at the same time they are. We're an ag county, different crops being harvested, trying to work with them on those kinds of things.

- Pete Wroblewski (Santa Barbara County): We're happy to share info with Caltrans. One of the reasons for our 10 foot centerline accuracy, it's not always consistent. Our linear referencing system is very segmented and it's not a complete system. So Caltrans can have our info, but I don't know how great it is. Collecting it would be a huge undertaking for us. Our bridges aren't even on our system. The undertaking of collecting all that data would be very costly and not feasible for us right now to get to the federal standard. We use Street Saver, it's been good for us.

- Patricia Romo (Riverside County): We have a robust GIS system with all pavement management info, survey data. But we don't collaborate with anyone else so we're isolated. We're in the process, we got an OTS grant, of collaborating with all cities in the county to get all accident data at a point where we're sharing it with each other, it would be helpful to incorporate statewide. As far as Caltrans info, most info we ask for is project related. The questions we get from the public are specific to projects on a state route that is more of a main street for public. We also do a lot of work on the state system and we collaborate with Caltrans to get info on project delivery.

  Greg Yarbrough: What do you think is the best method for receiving that information?

  Patricia Romo: It depends. Some of the road network system, it would be nice to see it on something where there is consistency. We talked about pavement condition, I'm not sure we're all looking at it the same way. We're incorporating bridge info from Caltrans into our own inventory. Maybe there is a way for us to work together, ability to download networks and attribution in terms of project and pavement information.

Greg asked if anyone from Caltrans wanted to talk about feedback they've received; no responses.

Other questions:

- Jeremy Lea (UC Davis): Does ARNOLD deal with standardization with versioning and change management?

Greg Yarbrough: We're looking at that as we consider LRS management tools. Looking at effects of a change in alignment, how does that change cascade to the features and events, other assets on that network. We'd expect any LRS to accommodate that.

Jeremy Lea: Concern when you say it can't be all things to everyone, need to have a flow of changes and not just data dumps.

Greg Yarbrough: Yes, the technology is there to track that.

Jeremy Lea: Point in time is not enough.

- Seth Scott (Fresno Council of Governments): Question of maintaining network. You were saying local agencies would provide centerline data and Caltrans would turn it into statewide LRS. Is that correct?

  Greg Yarbrough: Right now, Caltrans has developed a network with all local roads using Tiger. But it's a start. What we're doing now is trying to gauge level of interest and determine feasibility of establishing that exchange of data with locals to maintain the all roads network in the future. There has to be interest, and resources. What we want to do is make sure Caltrans has the tools in place to support that communication, if there is desire on the part of local governments.

  Seth Scott: How do you see maintenance? Giving locals parts they are responsible for? Or Caltrans maintains it, based on input from locals?

  Greg Yarbrough: Minnesota model is looking at two different systems where locals can log in too. If a local government has the staffing and expertise, they can manage their local system themselves, they would maintain their own centerlines. Other option is to allow redline capabilities where a local would go into a web service, create line work, vetted by DOT, then goes into network once approved.

  Seth Scott: Mile markers, are we using an X/Y birds eye mileage? Or X/Y/Z three dimensional mileage?

  Greg Yarbrough: Ideally they want 3D.

  Joe Hausman (FHWA): This is a problem of linear models, most are projected across a linear element. To do this properly, you need a 3D LRS to build upon Z elements. It depends on where you are; critical issue in hilly areas. This is a real issue in the LRS GIS world. Whatever you pick, you'll need to figure that out. We're already seeing benefits of ARNOLD in this state. This year, the reported number of miles of roadway went up dramatically (28%). That's going to affect resources assigned to this state.

  Greg Yarbrough: Great point, making sure your centerlines are accurate is going to influence the

centerline mileage that is submitted, and that influences funding provided for improvements.

Joe Hausman: Also affects crash rate when you add that many miles to your state. Another state can't locate their bridges on their LRS. A lot of impacts, once this all comes together.

- Frances Harrison (Spy Pond Partners, LLC): LRS is a moving target, not just because of construction activities, but because of continuous improvement process in the LRS and meanwhile data is placed on different versions. It's a real problem. People say LRS is such a headache, why can't we use GPS? What is the role of the GPS data in helping make this work better together?

  Greg Yarbrough: I think GPS data and helping to get better accuracy on the representation of the roadways; the centerlines. Most of the respondents so far are working with data that is 10-ft or greater accuracy. GPS, mapping-grade GPS can be greater than that. In terms of locating asset information, looking at signage and determining which side of the road is that on, getting better accuracy with the assets. Obviously GPS is being used more and more.

  Joe Hausman: LRS is really old, there was no GPS, people used latitudes and longitudes. There is legacy, and enterprises built upon that legacy. Almost all data today is collected with GPS. Have to come up with a way to translate that. I've asked a vendor to look – do we really want to do LRS anymore? Lat/long is still complicated to use versus a mile marker, mile post.

  Greg Yarbrough: Translating that is one of the things we're looking at in New Mexico, taking info captured in GPS and translating that to the LRS system.

Joe Hausman: I've not heard discussion of open source, crowd sourced data. Is anyone using that? <no response>. I just came from Florida transportation data symposium, and that was a big topic there. Waze app collects data. Open Source Data like Open Street Map is an effort to build GIS data from people. Can be source information data for roadways. There is also Open Source Software (GIS, databases).

Congestion Mitigation and Air Quality (CMAQ)

Dennis Jacobs (Caltrans)

Mr. Jacobs discussed the CMAQ program and how it relates to performance measures. CMAQ is a federally funded program to fund projects to contribute to attainment or maintenance of air quality standards. These funds are portioned out within state for projects, done by formula and street and highway data. Performance measures require the Secretary of Transportation, in consultation with States, MPOs, and other stakeholders, to publish rulemaking establishing measures for States to use to assess traffic congestion and on-road mobile sources within 18 months of enactment. Performance targets requires States to establish targets for these measures within 1 year of the final rule on national performance measures. Performance plans require each MPO with a transportation management area of more than one million in population representing a nonattainment or maintenance area to develop and update biennially a performance plan to achieve air quality and congestion reduction targets.

NPRM for system performance expected to be published October 2015, comment period until January 2016. What are the new performance measures for CMAQ? On-Road Mobile Source Emissions, need to reduce on and off road mobile sources. Currently have data for on-road sources. Our program will not address off-road sources with CMAQ funds. Congestion, OFTMP does not collect CMAQ data for Annual Hours of Delay. No mechanism in place to collect that data. PeMS should be able to capture if it's on state highway system, but our office does not have mechanism to collect that. This is a data gap for us that will need to be addressed.

Discussed data Caltrans currently receives from MPOs and RTPAs. MPOs and RTPAs report emission benefits for each CMAQ funded project, which Caltrans aggregates and uploads to the FHWA CMAQ database. This part of the reporting mechanism has worked well for many years and will continue to meet requirements of performance measures once we identify targets.

Q&A

- Dan Landon (Nevada County Transportation Commission): For rural areas, will CMAQ still be through the state? Many rural areas have no sensors.

  Peter Stephanos (FHWA): Point of clarification on those measures, those measures are what you report today to CMAQ. The actual measures that will be used will be proposed in the upcoming rulemaking. Just understand that it may not be annual hours of delay, may not be current CMAQ reporting. We've heard a lot from stakeholders about what these measures should be. Hopefully this proposal will be coming in the fall this year.

  Dan Landon: In rural areas, we don't have a lot of congestion so there will not be anything to report.

  Peter Stephanos: We did a lot of outreach into what a congestion measure could be.

- Julio Perucho (SBCAG): Is there a plan to implement PeMS throughout state, like detector stations?

  Rich Stone (Caltrans): We do not have plans to build out highway detectors. One of our wish list is to incorporate data into PeMS, to help close gaps in rural areas. We have a statewide census, so we know how much traffic we have, we just don't know how fast or slow its going.

System Performance

Rich Stone (Caltrans)

MAP-21 focuses on data-driven performance measures and outcomes, and we know that will include a reduction in congestion or management of congestion. We just received notice last week that NPRM is coming in November-December 2015, probably a 120-day comment period, and final rule in Q1 2018.

We have an extensive network of highway detection in most metro areas, but not the entire state. Nine of 12 districts are covered. Districts 1-2 (northern state) and 9 (Bishop) do not have significant coverage, and are not integrated in our PeMS system. Detectors feed into Caltrans Performance Measurement System (PeMS), which is different from NPMRDS because it has per-lane basis info. This helps engineers

set traffic management plans, do analysis for improvement options. We continue to support a traffic management system for our metropolitan areas. We have new data collection methods we are exploring, Bluetooth readers and purchased data.

Current reporting methods:

- Caltrans Mobility Performance Report (MPR): Detailed report of congestion, costs of congestion, bottleneck analysis. We are working on getting new data out quicker. Rolled up summary of PeMS data.
- Caltrans Strategic Plan 2015-2020: A lot of our data helps managing goals and reporting from strategic plan.

  Dan Landon (Nevada County Transportation Commission): Are there objectives for obtaining the sustainability goals?

  Rich Stone: Yes, it is in our strategic plan report online.

Reviewed recent data trends: rural populations are declining over time, shifting into larger urban populations, and average weekday (non-holiday) Daily Vehicle Hours of Delay (DVHD) is increasing every year. Discussed current congestion relief strategies, Active Traffic Management, State Highway Operation and Protection Program (SHOPP), Smart Corridor and Connected Corridors, HOV/HOT Lanes and Multi-Modal Options.

What to expect in NPRM? Congestion in terms of aggregate or average daily delay. Other possible requests include travel time reliability, origination vs destination travel times, and bus or transit delay / performance.

<u>Q&A</u>

- Julio Perucho (SBCAG): For congestion performance measure, will there be sub-areas? Or just county- or MPO-wide?

  Peter Stephanos (FHWA): The requirement is that there is a statewide measure and target, and then as we proposed with pavement/bridges, if the State wants to set separate targets for portions of state. MPOs are required to set targets for the MPO area.
- Alex Estrella (SANDAG): Are we going to be using PeMS? Or is this the local dialogue as primary tool for rulemaking?

  Rich Stone: Anyone is welcome to use our PeMS system. I don't know what the rule is going to be or what you'll be expected to do.

  Alex Estrella: Will NPRDMS have transit data or just flow data?

  Peter Stephanos: The NPMRDS has travel times for all vehicles, and then separately for trucks. There are probes that are on vehicles on the highway, some probes may be individuals sitting on a bus, but it does not break out transit. It just includes highway travel time for passenger vehicles and trucks.

Alex Estrella: We, SANDAG, use PeMS. The value I'd like to offer for local agencies, we focus on TDM. We focus on providing level of infrastructure investments that provide options. You mentioned you will be looking at integration of NPRDMS and also probe data. To the extent possible, also offer any available data feed to local partners. In San Diego we have an effort to provide options with transit lines.

Rich Stone: I think we are hoping to be able to collaborate with everyone in the room, sharing our data and using anyone else's data.

- Peter Stephanos: Do your detectors capture 100% of traffic that's flowing in that section?

  Rich Stone: They don't capture motorcycles that lane-split. Other than that, we believe they capture any piece of metal that runs over the sensor. So we get a sense of throughput, VMT flow, number of cars over a certain detector.

- Peter Stephanos: For your hot lanes, do you have methods to detect number of occupants in vehicles? Do you record that?

  Rich Stone: The technology exists, I don't believe we have integrated it in our HOT or HOV lanes. District 4 has more involvement in managed lanes.

Freight

Joanne McDermott (Caltrans)

US DOT sets National Freight Movement for States measures. Currently, Caltrans does not report on specific freight performance measures. As part of this workshop, we've had a lot of conversations we haven't had before and I hope they continue. When you think of freight performance measures, it is multi-modal. Freight information challenges? There is an abundance of data, but a lack of complete data. No single entity has all the data we need. One of the challenges with freight is a lot of the data is in the private sector and they may not want to share the data because they don't want to share information with competitors. AASHTO recommends states be given flexibility in target setting; Caltrans working on developing a freight model, hoping to have by end of year.

Safety

Thomas Schriber (Caltrans)

Mr. Schriber introduced the safety team, representatives in Caltrans from Transportation Planning, Local Assistance, Research, Strategic Highway Safety Plan, and Traffic Operations. Robert Peterson (local assistance), John Ensch, Rich Stone, Andy Knapp, Eric Wong. Randy Weissman, Office of Traffic Safety. CHP members Isaac Tillman, Jennifer Mercado, Dalila Fontana.

Presented overview of NPRM on Safety. Inputs into Highway Safety Improvement Plan include MIRE (model of inventory roadway elements), Fatalities and Serious Injuries and Highway Safety Improvement Program (HSIP).

- MIRE: 202 total MIRE elements. Not all MIRE elements are required under federal data requirements, but there are certain fundamental elements we should have for all public roads. Questions to ask: Should there be a statewide approach? We have SWITRS for statewide collision information; should we do something similar for roadway inventory? Once we have up and running, how do we keep the information updated and supported?
- Fatalities and Serious Injuries: Reporting number and rate. All states will be using nationwide FARS for fatality numbers. Caltrans will set statewide targets. Then, MPOs will set their own (or mirror the state). There are also options for reporting – report on all routes together, or break to urban and rural. Can also do fatality numbers urban and rural, and fatality rate overall.

Q&A

- Elisabeth Hahn (Stanislaus Council of Governments): Will these rates be broken out by functional class? Isn't that something to look at?

  Thomas Schriber: It will be for all public roads within that jurisdiction. The options to break it out will be urban or rural. Proposed rulemaking did not have anything about functional class.

  Peter Stephanos (FHWA): Regarding urban rule, in the proposal, it would be a requirement for all four measures there is a statewide target. Optionally, there would be two additional targets – one that represents all urban, and one that represents all rural. Either one or three. We asked for comment on that approach, and got a lot of feedback. Opportunities for us to provide a little flexibility there. The other point is that setting the required targets, we can certainly expect that within a state working with MPOs and local agencies, they may agree to set targets for certain portions of the state or certain classes of roadway that would help with investment making. Finally, the highway safety plan reported to NTSA, have to have identical targets between NTSA and MAP21. Also received a lot of comments on that, and feds are looking at how to address that.

- Mike Selling (San Joaquin County): Will these targets exclude impaired drivers?

  Thomas Schriber: I don't believe the targets will exclude any type of driver.

  Peter Stephanos: Targeting and measure includes all fatalities and all serious injuries, regardless of reason. The NTSA reporting has some of that breakout. The proposal is that it includes everything, so the guidance is that when you set your target, you consider factors you have control over as well as those you don't.

- Frances Harrison (Spy Pond Partners, LLC): What is the source of traffic data for rates?

  Thomas Schriber: Fatalities will come from FARS, Serious Injuries from SWITRS. Denominator will be vehicle miles travelled reported to HPMS.

Breakout Exercise

Tables were assigned one of two discussion topics: 1) MIRE collection, 2) safety performance, and given discussion points for each topic (see below). The exercise provided an opportunity for attendees from

different agencies to share their experiences and challenges with Safety data and provide well-rounded feedback to FHWA and Caltrans.

Discussion topics:

- MIRE Collection:
    - How to accomplish data collection
    - Store data in central repository or separate systems?
    - How to determine responsibilities and total list of participants
    - Determine scale of MIRE collection
    - Considerations of data maintenance and updates
- Safety Performance:
    - Approach to target setting
    - How to improve traffic data collection on local roads
    - Coordination on reporting
    - Implementing safety measures across the state

Results of breakout:

- Seth Scott (Fresno Council of Governments) MIRE Collection: Data collection makes more sense for DOT to say this is what we want the data to look like, and have local agencies contract out to collect. Like the idea of storing idea in central repository and having web portal where people can maintain it. Responsibility for data would be on case-by-case basis. For us, would be good to train county people on how to enter and maintain the data going forward.
- Dai Bui (Los Angeles County): We focused on all four Safety bullets. Trying to think of integrating with public and smartphones – an app, runs in background, sends anonymous data to central repository. Use info to create mechanism to give a representative percentage. Would help to improve data collection without having to go out and install/move physical equipment.
- Offer Grembek (UC Berkeley): With MIRE collection, if/when significant data collection efforts will be done, important to have previous phase before that to see if data covers all needs of the state. Could realize it is different at state highway system vs locals, some data already available but may not be level of detail or consistency that is needed. In parallel for locals, a lot of data is not available yet. These earlier efforts are important to do before you do significant data collection. With respect to centralized system, there are advantages and disadvantages to both.
- Mike Selling (San Joaquin County): Hope FHWA will look at 10 year trend to smooth the data so you don't see high/low spikes. Impaired drivers on accident data, can we separate accidents by types – things that can be addressed by education, engineering. Some things we can do for safety improvements in engineering, it's more enforcement/education aspect. Would hope we could come up with categories of accident data in terms of setting a target. It's also very important to have an urban and rural target. San Joaquin has a one-county MPO, we would have concern if we were to go by urban-skewed approach. Cities, likewise, would not like to see a rural-heavy approach.

- Robert Peterson (Caltrans): With MIRE data, requirement from feds is that every local agency has to be compliant to do a good safety analysis. Hard to come up with alternatives if you're just looking at crashes. Is there a requirement for one MIRE data collection or can everybody do their own collection, have their own system, and then become MIRE compliant?

  Peter Stephanos (FHWA): This is another rulemaking that is not finalized yet. We got a lot of comments on the time it will take to collect this data. The expectation is that how you collect the data is up to the state and locals, but there is a requirement of using the HPMS to report the data (and the state is the one who reports it there).

- Peter Stephanos: Our table had a good discussion, important to emphasize our rulemaking did not specify how state/local agencies would work together to set the targets. Lot of discussion of top-down or bottom-up approaches, different parts of state set targets that roll up to a state target… that's really up to the State. At the end of the day there must be coordination. We don't spell out how you pass the test for coordination; that is your decision. The idea is that this isn't done in a vacuum where state sets targets and MPOs do their own thing.

  Thomas Schriber: Not only that coordination between agencies, but how does it tie into strategic plan and highway safety program.

With Safety, next steps are getting finalized rules, and then finding strategies to become MIRE compliant, setting safety targets, what are the interactions between locals and state. All those next steps will take place after the rulemaking is finalized.

MAP-21 Communications

Peter Stephanos (FHWA)

There are many questions about how the activities and rulemakings fit together. We have struggled with trying to communicate that in an effective way.

We are currently developing training materials so that once the rules are final, there will be training courses that talk about the specific regulations and how each of them work together. The intent is that each performance area have targets set and plans developed, and through the planning process you look for trade-offs, for example be aggressive in safety, but not as much in bridges, etc. That brings together MPOs and States to get a comprehensive plan for performance in the area.

Mr. Stephanos previewed an as-of-yet unpublished animated presentation explaining how these pieces fit together, to gather feedback from attendees.

Advancing Performance Management Under a National Framework

Frances Harrison (Spy Pond Partners, LLC)

Ms. Harrison asked attendees where they fell on a scale of 1 to 10 regarding MAP-21 implementation (where 1 meant they had no concerns and 10 meant they were highly stressed). Two attendees indicated they were lower than 5, with the remainder of participants indicating they were above 4.

There is a lot of uncertainty about how to achieve these requirements. The most productive approach is to think about how this can be used to your benefit – which has been the spirit of other MAP-21 projects Spy Pond has been involved with – as opposed to "how do we jump through all these hoops from the Feds". Two key benefits are: 1) this can help California make better use of money and better decisions, and 2) you now have to show the public what you're doing with their money, show performance and quantifiable improvements.

There were challenges reaching a consensus during the AASHTO task force (prior to the NPRMs), but ultimately there was compromise. During a recent peer exchange in Detroit, there was talk of shifting the paradigm around what transportation data we collect so we can strengthen linkages between transportation and economic development. The January 2015 GAO Report discusses implementation challenges for MAP-21; while there are many challenges, there is also a lot of research, which is a valuable resource as we move forward.

Ms. Harrison provided an overview of two projects with ties to MAP-21:

1. NCHRP 20-24(97) Advancing Performance Management under a National Framework
2. FHWA Office of Performance Management Transportation Performance Management Toolbox (TPM TAP)

1. NCHRP 20-24(97) Advancing Performance Management under a National Framework

The purpose of this project is to address challenges and opportunities associated with implementing MAP-21, and to develop a research roadmap to inform future investments in research dollars to be undertaken. The project has funding set aside specifically to address items of concern for senior executives at the departments of transportation.

One key activity was to review the four major data sets and identify opportunities for improvement. Our findings:

- National Performance Management Research Data Set (NPMRDS): The key challenges with this dataset are due to its large size and incompatibility with agencies' data. Opportunities for improvement include making the data available to agencies in smaller subsets, or potentially bringing in an outside vendor to implement a new database.
- Highway Performance Monitoring System (HPMS): A powerful data set used for a lot of purposes at the National/State level. It was originally designed just for national use, so some states may not have given same attention/validation of data as they would if they were using it themselves. Additionally, data quality is uneven and data is unidirectional.
- National Bridge Inventory (NBI): Stores national-level bridge inventory and condition. There is great variety across data (resulting from inspectors' visual inspections), so it needs more consistent training.
- Fatality Analysis Reporting System (FARS): Users are generally happy with this as a source of fatality data. Issues include a time lag in data, although fatalities are a rare event so data trends hard to capture. Additionally, FARS does not have VMT (vehicle miles travelled) data.

Ms. Harrison asked attendees for other examples of limitations with data.

- Patricia Romo (Riverside County): Which performance areas apply to NHS, State only, and All Public Roads?

  Frances Harrison: All Public roads is primarily related to Safety data, where you need those fundamental MIRE elements. Pavement and Bridge only pertain to the National highway system.

Ms. Harrison asked how many attendees had hands-on experience with each of the systems (NPMRDS: 1, HPMS: approximately 12, NBI: 3, FARS: 4) and for attendees' overall impression of the systems on a scale of 1 (negative) to 10 (positive). Two audience members indicated less than 5, and approximately half the audience indicated higher than 4.

Peter Stephanos: FHWA is developing operating procedures for how data is entered in those systems, which we will use as a boundary for how to extract data from the database. In undertaking this, we're finding lots of little issues and we have to have documentation on how we will address each of those issues. Our objective is we will get these operating procedures down and once we have final rules, we'll make that available to States and MPOs so you know how we calculate this data.

Frances Harrison: The second key activity for this project was to develop a research roadmap. Our approach was to compile recent and in-progress research, share it with stakeholders to identify additional needs, and build a tool for ongoing management of research pipeline.

Ms. Harrison reviewed the current and in progress research that was used in this effort and discussed the future research ideas resulting from it. Ms. Harrison asked the audience for additional suggestions of research needs to help with MAP-21 implementation (there were none).

2. FHWA Office of Performance Management Transportation Performance Management Toolbox (TPM TAP)

The TPM TAP project helps States, MPOs and transit agencies understand what the state of transportation performance management is, identify how to improve it, and provides a toolbox (not just for MAP-21, but certainly can be used towards those goals).

A key output has been the Capability Maturity Model (the TPM Framework). The TPM Framework model started as a circular process with a lot of feedback loops. It contains sequential steps: setting goals/objectives, benchmarking and target setting, performance-based planning and programming, monitoring and adjusting, recording and communication. All of this is done in a culture that supports transportation performance management (leadership support, well-defined roles and responsibilities, training). External collaboration is also needed – both in planning/programming and in monitoring and recording. There will be a TPM Implementation Guidebook will have sections for each step of the maturity model.

Ms. Harrison provided examples of how data collaboration worked in different states:

- Michigan has a Transportation Asset Council, which was started in response to legislation. They have a standard process of collecting data for all roads and bridges, and have a website and dashboard. The council submits a report on yearly activities and expenditures. They are not an

IRI-friendly state (so it may be worth it for California to check-in with them on how they are approaching pavement standards).

- Washington has a Target Setting Framework Group, director-level, that meets quarterly to make decisions on how to do this and what data to use. They also have a working group that meets monthly and gets further down into the weeds, and is supported by technical teams for each of the measure areas.
- Florida has a Performance Collaboration Task Force containing State and MPO agencies. Goals are to standardize performance measures statewide, have MPOs collect data on non-state system and have a data sharing user group.
- The Northern New England Tri-States (Maine, New Hampshire and Vermont) have a coalition to jointly develop a maintenance management system. They are talking about sharing information and standardizing performance measures across the states.
- Texas DOT and Association of MPOs are coordinating preparation for MAP-21, using Texas Transportation Institute to create performance indicators.
- National Capital Region has a probe data user group and provides a regional platform for user feedback on collecting and using probe data.

Q&A / Feedback

- Mike Selling (San Joaquin County): The biggest challenges are going to be resources.
- Patricia Romo (Riverside County): Is there data on the cost of collaborating on data collection?

  Frances Harrison: There is selective information on particular data gathering efforts. Utah DOT has done presentations on per-mile cost of data collection and data element extraction. Better information understanding the costs would be useful to help with discussions. Hard to do comparisons, apples to apples, because each agency is different.

- Jennifer Mercado (CHP): Not always does data reach SWITRS. Not all data points are in SWITRS. So bear that in mind as you go back to your local agencies, collectively collaborating on all the variables that are needed. We don't have a uniform way of collecting data (Texas has a mandatory form). Local entities have now invested in a third party and they have modified the form to the point where it cannot be entered into SWITRS. A good majority of local entities have not reached out and will be surprised when their data is not in SWITRS. Vehicle Code does say you have to submit your fatalities and injuries by the 5th of the following month. That is not happening. Currently, CHP is caught up through January in current data. For the first time in many years, PDOs are under 100,000. They have a grant to perform catch up data entry. FARS data can be a year behind. It will be a struggle to come together. Jennifer cares about quality assurance – self-reporting systems can be unreliable. Allowing public to indicate accidents at an intersection, pedestrians and bicyclists can over-report or lie. Half a million paper documents come through our office, some are things our office does not handle (DUIs). Trying to create an electronic interface (iSWITRS) and should be available for public to use.

- Frances Harrison: How are you going to address the pavement issue here?

  Mike Selling (San Joaquin County): Is CA the only state pushing back on IRI/PCI? IRI does not fit, not a one size fits all. It's not for Caltrans, it's not for the locals.

  Frances Harrison: I think the initial idea was that IRI was the single most consistent indicator of pavement condition across states, but it wasn't the only indicator. That's why there is the cracking piece. There was an attempt to rely on existing data. A number of agencies use a combination of IRI and cracking to characterize their pavement condition to reflect the user perspective. Michigan has not used IRI. I don't envy Peter and his group having to come up with national measures that will be palatable to everybody.

  Peter Stephanos: There were comments more from California about an entity using another measure, California has more responses about PCI being the measure. Wisconsin uses PCI. Our measure is not IRI and solely IRI; our measure is IRI, cracking, and rutting. A pavement will not be rated on IRI alone in our proposal.

  Jan Smith (Trinity County): That's only NHS roads?

  Peter Stephanos: Yes.

  Frances Harrison: On system performance, you have a tool (PeMS) you want to build on, right? The main issues I heard at this workshop were what to do about pavement issue, what do you do beyond the 2 years where Caltrans collects data, sounds like bridges is pretty good shape, Safety has issues of inventory data and how to address in collaborative way, and air quality/freight issues are not solidified enough to know.

  Peter Stephanos: What would keep me up at night, some of this data reporting is getting better and better each year. With Safety, there's a lot that is not being reported today but through some of the efforts we discussed, it will be reported. If performance data is changing because of better data collection (not actual environment or behavior changes), it will be hard to tell that story. That's why we're implementing this over time. That way we don't have to explain why numbers are changing for reasons other than performance based; it's just the data is being collected better. It was helpful to hear that message, so we at FHWA can do what we can to support that.

  Frances Harrison: It's a trade-off between improving your methodology and losing your trend data.

Closing Remarks

Giles Giovinazzi thanked the afternoon's speakers, and in his closing remarks reiterated Caltrans' commitment to working with all the attendees in the coming months and referred everyone to the Caltrans MAP-21 website for updates on California's implementation efforts.

Appendix A. Agenda

MAP-21 Performance Management
DATA ASSESSMENT WORKSHOP
August 24-25, 2015

MONDAY – August 24, 2015

9:00 – 10:45 am	Welcome California Department of Transportation Federal Highway Administration	Giles Giovinazzi Malcolm Dougherty Vince Mammano Peter Stephanos
10:45 – 11:00 am	Break	
11:00 – 12:00 pm	Regional and Local Agencies	Dave Vautin Dan Landon
12:00 – 1:00 pm	Lunch	
1:00 – 4:30 pm	Physical Infrastructure • Pavements • Bridges • Culverts • Intelligent Transportation System (ITS) Elements • Risk Mitigation Plan Development	Mike Johnson Tom Pyle Pete Whitfield (Mike Johnson) Parviz Lashai Brian Simi Matt Friedman Michelle Tucker (Shanna Everts & Eric Strader)

TUESDAY – August 25, 2015

9:00 – 10:45 am	California Linear Referencing System (LRS)	Mark Samuelson (Joe Hausman, Greg Yarbrough, John Wisdom)
10:45 – 11:00 am	Break	
11:00 – 12:00 pm	Congestion Mitigation and Air Quality System Performance Freight	Dennis Jacobs Rich Stone Joanne McDermott
12:00 – 1:00 pm	Lunch	
1:00 – 2:30 pm	Safety	Thomas Schriber
2:30 – 2:45 pm	Break	
2:45 – 4:15 pm	Advancing Performance Management Under a National Framework	Frances Harrison
4:15 – 4:30 pm	Closing Remarks	Giles Giovinazzi

Appendix B. Handouts

The following are reproductions of, or hyperlinks to, handouts distributed to attendees of the workshop.

B-1. Potential MAP-21 Performance Measures / Data Needs Matrix

A paper version of this matrix was distributed at the workshop. Due to its size and complexity, we have included a link to the current version here:

http://www.dot.ca.gov/hq/transprog/map21/implementation/map21-pm-dataneeds-final.xlsx

B-2. Pavement Performance Measurement Fact Sheet

May 2015

Pavement Performance Measurement

Asset Type: Pavement

Scope of Data Included in Performance Measure

Pavements are required to satisfy both Moving Ahead for Progress in 21st Century (MAP-21) and the California Government Code requirements. Accordingly, there are two distinct reporting scopes.

For MAP-21 reporting, the scope of this measure will be all HPMS Pavement Inventory that carry the National Highway System (NHS) regardless of ownership. The summary reporting will be broken down by State or Local Agency ownership with total for the inventory and each condition category.

For the California Government Code reporting, this measure will include all State Highway System (SHS) pavement that carry vehicular traffic.

Data Update Frequency

The pavement condition data on the state highway system is updated on an annual basis. In 2015, an automated pavement condition survey (APCS) will collect data on approximately 15,000 centerline miles of pavement on the state highway system owned by the state. The local NHS is collected every two years. About 6,000 centerline non Interstate NHS miles owned by local agencies will be collected in 2015 and 2016.

Summary of Performance Measure

The 2015 pavement condition survey is classified into categories of Good, Fair and Poor as the Federal Highway Administration (FHWA) for MAP-21 reporting. This will be APCS collected. The proposed rule may change prior the final rule being published in the Code of Federal Regulations.

Performance Measure Calculation Detail

The following detailed calculation of the pavement performance measure is taken directly from the Federal Highway Administration Notice of Proposed Rule Making for Pavement and Bridge Performance Measures. The calculation method defined below is subject to change in the final rule.

Code of Federal Regulation Sections 490.307 and 490.407 propose that State DOTs and MPOs use a total of three measures to assess the condition of pavements on the NHS. The proposed pavement measures would be applicable to both Interstate and non-Interstate NHS mainline. The pavement measures would reflect the percentage of the system in good and poor condition. The fair category will be assumed to be the remained after good and poor quantities are deducted from the total. The measure calculations would utilize data documented in the Highway Performance Monitoring System (HPMS).

Section 490.315 proposes the minimum level for condition of pavements on the Interstate System as required by 23 U.S.C. 150(c)(3)(A)(iii).

Section 490.307 National performance management measures for assessing pavement condition:

A. To carry out the NHPP, the performance measures for States to assess pavement condition are:
1. Percentage of pavements of the Interstate System in Good condition;
2. Percentage of pavements of the Interstate System in Poor condition;
3. Percentage of pavements of the non-Interstate NHS in Good condition; and
4. Percentage of pavements of the non-Interstate NHS in Poor condition.

B. State DOTs will collect data using the methods described in Section 490.309 and will process this data to calculate individual pavement metrics for each section of pavement that will be reported to FHWA as described in Section 490.311. State DOTs and FHWA will use the reported pavement metrics to compute an overall performance of Good, Fair, or Poor, for each section of pavement as described in Section 490.313.

The four condition metrics include:

- IRI
- Rutting
- Faulting
- Cracking Percent.

The data elements include:

- Through Lanes
- Surface Type

These measures require the States to collect the Interstate:

- Full Extent of the mainline highway
- In the rightmost travel lane
- Continuously collected and reported in 0.1 mile sections
- In both directions of travel
- Annually

For Non-Interstate NHS:

- For IRI
- Full extent
- Rightmost travel lane
- Continuously collected and reported in 0.1 mile sections
- In one direction of travel
- Biennially
- For Cracking Percent, Rutting, and Faulting metrics collected prior to December 31, 2019
- Using sampling methods outlined in the HPMS field manual
- Biennially
- For Cracking Percent, Rutting, and Faulting metrics collected after December 31, 2019
- Full extent
- Rightmost travel lane
- Continuously collected and reported in 0.1 mile sections
- In one direction of travel
- Biennially

Pavement Condition Thresholds:

Measurement	Good	Fair	Poor
IRI (inches/mile)	<95	95-170 95-220*	>170 >220*
Cracking (%)	<5	5-10	>10
Rutting (inches)	<0.20	0.20-0.40	>0.40
Faulting (inches)	<0.05	0.05-0.15	>0.15

*Population >1M

Calculation of Pavement Measures (490.313):

	Asphalt and Jointed Concrete	Continuous Concrete	
Overall Section Condition Rating	3 metric ratings (IRI, cracking and rutting/faulting)	2 metric ratings (IRI and cracking)	Measures
Good	All 3 metrics rated "good"	Both metrics rated "good"	Percentage of lane-miles in "good" condition
Poor	≥ 2 metrics rated "poor"	Both metrics rated "poor"	Percentage of lane-miles in "poor" condition

B-3. Bridge Performance Measurement Fact Sheet

May 2015

Bridge Performance Measurement

Asset Type: Bridges

Scope of Data Included in Performance Measure

Bridges are required to satisfy both Moving Ahead for Progress in 21st Century (MAP-21) and the California Government Code requirements. Accordingly, there are two distinct reporting scopes.

For MAP-21 reporting, the scope of this measure will be all National Bridge Inventory (NBI) bridges that carry the National Highway System (NHS) on the deck of the bridge regardless of ownership. This will include all closed local agency owned NBI bridges. The summary reporting will be broken down by State or Local Agency ownership with total for the inventory and each condition category.

For the California Government Code reporting, this measure will include all State Highway System (SHS) bridges that carry vehicular traffic. This will include all overcrossing structures and bridges that carry the SHS that are shorter than the limits established by the Federal Highway Administration for the NBI.

Data Update Frequency

The bridge condition data is updated on an ongoing basis with most bridges receiving an inspection once every two years. Approximately 1000 bridges owned by the state and local agencies statewide are inspected in any given month. Data update frequency as requested.

Summary of Performance Measure

The bridge condition will be weighted by bridge deck area and will be classified into categories of Good, Fair and Poor as defined by the Federal Highway Administration (FHWA) for MAP-21 reporting. Refer to CFR 490 Subpart D – National Performance Measures for Assessing Bridge Condition. *The proposed rule may change prior the final rule being published in the Code of Federal Regulations.*

Performance Measure Calculation Detail

The calculation method for determining Good, Fair or Poor condition bridges is established in the FHWA Notice of Proposed Rule Making for bridge and pavement performance measurement as follows:

Calculation of national performance management measures for assessing bridge condition.

(a) The bridge performance measures shall be calculated in accordance with this section and used by State DOTs and MPOs to carry out the bridge condition related requirements of this part.

(b) The condition of bridges on the NHS, including bridges on ramps connecting to the NHS, shall be classified as Good, Fair, or Poor following the criteria specified in this paragraph. The assignment of a classification of Good, Fair, or Poor shall be based on the bridge's condition ratings for NBI Items 58—Deck, 59—Superstructure, 60—Substructure, and 62—Culverts. For the purposes of national performance measures under the NHPP, the method of assessment to determine the classification of a bridge will be the minimum of condition rating method, i.e., the condition ratings for lowest rating of a

bridge's 3 NBI Items, 58—Deck, 59—Superstructure, and 60—Substructure, and will determine the classification of a bridge. For culverts, the rating of its NBI Item, 62—Culverts, will determine its classification. The NHS bridges will be classified as Good, Fair, or Poor based on the following criteria:

(1) Good: When the lowest rating of any of the 3 NBI items for a bridge (Items 58—Deck, 59—Superstructure, 60—Substructure) is 7, 8 or 9, the bridge will be classified as Good. When the rating of NBI item for a culvert (Item 62—Culverts) is 7, 8, or 9, the culvert will be classified as Good.

(2) Fair: When the lowest rating of any of the 3 NBI items for a bridge is 5 or 6, the bridge will be classified as Fair. When the rating of NBI item for a culvert is 5 or 6, the culvert will be classified as Fair.

(3) Poor: When the lowest rating of any of the 3 NBI items for a bridge is 4, 3, 2, 1, or 0, the bridge will be classified as Poor. When the rating of NBI item for a culvert is 4, 3, 2, 1, or 0, the culvert will be classified as Poor.

(c) The bridge performance measures shall be calculated for the applicable bridges per paragraph (a) of this section that pertain to each target established by the State DOT or MPO in § 490.105(e) and (f), respectively, as follows:

(1) The performance measure for the Percentage of bridges classified as in Good condition shall be computed and reported to the one tenth of a percent as follows:

$$\frac{\Sigma_{GOOD}\,[\text{length x width}]_{\text{Bridge p}}}{\Sigma_{TOTAL}\,[\text{length x width}]_{\text{Bridge s}}}$$

Where:

GOOD = total number of the applicable bridges, where their condition is Good per paragraph (b)(1) of this section;

g = a bridge determined to be in Good condition per paragraph (b)(1) of this section;

Length = corresponding value of NBI Item 49—Structure Length for every applicable bridge;

Width = corresponding value of NBI Item 52—Deck Width or value of Item 32 Approach Roadway Width for culverts where the roadway is on a fill [i.e., traffic does not directly run on the top slab (or wearing surface) of the culvert] and the headwalls do not affect the flow of traffic for every applicable bridge.

s = an applicable bridge per paragraph (b) of this section; and

TOTAL = total number of the applicable bridges specified in paragraph (b) of this section.

(2) The performance measure for the Percentage of bridges classified as in Poor condition shall be computed and reported to the one tenth of a percent as follows:

$$\frac{\Sigma_{POOR}\,[\text{length x width}]_{\text{Bridge p}}}{\Sigma_{TOTAL}\,[\text{length x width}]_{\text{Bridge s}}}$$

Where:

POOR = total number of the applicable bridges, where their condition is Poor per paragraph (b)(3) of this section;

p = a bridge determined to be in Poor condition per paragraph (b)(3) of this section;

Length = corresponding value of NBI Item 49—Structure Length for every applicable bridge;

Width = corresponding value of NBI Item 52—Deck Width or value of Item 32 Approach Roadway Width for culverts where the roadway is on a fill [i.e., traffic does not directly run on the top slab (or wearing surface) of the culvert] and the headwalls do not affect the flow of traffic for every applicable bridge.

s = an applicable bridge per paragraph (b) of this section; and

TOTAL = total number of the applicable bridges specified in paragraph (b) of this section.

B-4. Culvert Performance Measurement Fact Sheet

May 2015

Culvert Performance Measurement

Asset Type: Culverts

Scope of Data Included in Performance Measure

The scope of culvert performance measurement will be to include all culverts within the State Highway System (SHS). The summary reporting can be broken down by districts, route and post mile with total for the inventory and each condition category.

Data Update Frequency

The culvert condition data is updated on an ongoing basis. With an estimated total count of over 205,000 culverts within the SHS, it is estimated that the entire statewide inspection will be completed in about 8 years. Approximately 12000 culverts within the SHS are inspected each year.

Summary of Performance Measure

The culvert condition is captured by the count and is classified into categories of Good, Fair and Poor.

Performance Measure Calculation Detail

The calculation method for determining Good, Fair or Poor condition culverts is based on the following procedure. Total Culvert Assessment Scores are calculated utilizing Culvert Elemental Inspection Assessment Scores. Culvert Elemental Inspection Assessment Scores are inspections of five different culvert elements and assigning a score based on its observed condition. During a culvert inspection the inspector makes an assessment on the culvert's condition by evaluating five culvert attributes:

1. Waterway Adequacy
2. Joints
3. Materials
4. Shape, and
5. Alignment

Each attribute is given an assessment grade based on its observed condition. The assessment grade reflects what type of maintenance is needed based on the condition of the assessed attribute. The assessment grades are used to assign a Health Index Number (HI) to each culvert. The HI number is from 0 to 100. Lower Health Index Numbers represent worsening condition and more critical maintenance needs.

A. Like New Condition
B. No Attention Needed (Good)
C. Needing Maintenance Preventative in Nature (Fair)
D. Needing Maintenance Major Rehabilitation/Replacement (poor)
E. Needing Immediate Attention

B-5. ITS Element Performance Measurement Fact Sheet

June 2015

ITS Element Performance Measurement

Asset Type: ITS Elements

Scope of Data Included in Performance Measure

The following ITS Elements, Vehicle Detection Stations (VDS), Ramp Meters (RM) and Changeable Message Signs (CMS), are the asset classes identified by the California Transportation Commission (CTC) as prescribed in SB 486 . ITS elements exist only on the State Highway System (SHS).

Vehicle Detection Stations are electronic devices that monitor traffic conditions on a freeway segment. The real-time data that the monitoring stations collect are the traffic volumes and occupancy. These data are then used for incident detection, ramp metering control, and data collection/analysis through the Central Management Applications for efficient incident response. Detection types include: loop detectors, Microwave Vehicle Detection, Wireless Vehicle Detection and Video Detection.

Ramp meters are signalized devices installed on freeway on-ramps to regulate the rate traffic enters freeways in congested urban corridors. Ramp Meter systems monitor mainline traffic conditions and adjust the on ramp flow rates. This process allows demand on the mainline to be managed as to delay or eliminate the onset of recurrent congestion.

Changeable Message Signs are electronic messaging devices that are installed along the freeway prior to major traveler “decision points” such as freeway-to-freeway interchanges or freeway splits. These signs relay important traveler information including traffic conditions, travel time, incidents, advisory messages and safety messages.

Data Update Frequency

Data are updated continuously and reported annually.

Summary of Performance Measure

The performance measure will be the number of each of the ITS elements that need to be replaced because they are non-operational or operational and have exceeded their useful life. Non-operational is generally defined as elements that have deficiencies that exceed routine maintenance.

This measure does not include future or new ITS element needs.

Performance Measure Calculation Detail

Element counts are derived by searching the TMS database. Locations and elements are categorized as “good” or “poor.” “Good” will indicate items and locations where elements are present and functional. “Poor” will indicate items and locations where elements are non-operational or beyond their useful life.

B-6. CMAQ Performance Measurement Fact Sheet

August 2015

CMAQ Performance Measurement Fact Sheet

Congestion Mitigation and Air Quality Improvement Program

The Congestion Mitigation and Air Quality (CMAQ) program funds transportation projects or programs that will contribute to attainment or maintenance of the National Ambient Air Quality Standards for ozone, carbon monoxide, and particulate matter. Moving Ahead for Progress in 21st Century Act (MAP-21) continued the program and provided approximately $455 million of CMAQ funds annually to California. These funds are distributed to Metropolitan Planning Organizations (MPOs) and Regional Transportation Planning Agencies (RTPAs) in federally designated air quality nonattainment and maintenance areas within the state in accordance with the formula set forth in Section 182.7 of the California Streets and Highways Code.

Performance Requirements for CMAQ

Performance Measures: Section 1203 of MAP-21 (which amends 23 U.S.C. § 150(c)) requires the United States (U.S.)Secretary of Transportation, in consultation with States, MPOs, and other stakeholders to publish rulemaking establishing measures for States to use to assess traffic congestion and on-road mobile sources within 18 months of enactment. U.S Department of Transportation shall establish measures for States to use to assess: traffic congestion and on-road mobile source emissions.

Performance Targets: Section 1203 of MAP-21 (which amends 23 U.S.C. § 150(c)) also requires States to establish targets for these measures within 1 year of the final rule on national performance measures.

Performance Plans: Section 1113 of MAP-21 (which amends 23 U.S.C. § 149(l)) requires each MPO with a transportation management area of more than one million in population representing a nonattainment or maintenance area to develop and update biennially a performance plan to achieve air quality and congestion reduction targets.

The Notice of Proposed Rulemaking (NPRM) for System Performance (known as Performance Management 3, which will include CMAQ, Freight and Congestion performance measures) has not yet been published. As of July 2015, this NPRM is expected to be published in late October 2015 and the comment period is expected to close in late January 2016. “States are required to establish targets for these measures within 1 year of the final rule on national performance measures.” (§1203, 23 U.S.C 150(d))

For more information, see these links:

Federal Highway Administration (FHWA) MAP-21 CMAQ Fact Sheet
http://www.fhwa.dot.gov/map21/factsheets/cmaq.cfm

FHWA MAP-21 Performance Management Fact Sheet
https://www.fhwa.dot.gov/map21/factsheets/pm.cfm

Available Data Caltrans Receives from MPOs and RTPAs

Criteria Pollutant Emissions: Currently, MPOs and RTPAs report emissions benefits for each CMAQ funded project in kg/day for the following pollutants: ROG (reactive organic gasses/VOC (volatile organic gasses), CO August 2015 (carbon monoxide), NOx (oxides of nitrogen), PM-10 (particulate matter) and PM-2.5. Caltrans receives this data and prepares the Statewide CMAQ Annual Report, which is uploaded into FHWA's CMAQ database on an annual basis.

New Performance Measures for CMAQ

Congestion: The Office of Federal Transportation Management Program is not the data steward for **Annual Hours of Delay**. This data is owned by the Division of Traffic Operations, Office of Performance. Performance Measurement System (PeMS) should be able to capture this data if it were on the State Highway System (SHS). However, some CMAQ projects sponsored by the MPOs are on local arterials and not on the SHS which will pose challenges for data collection. There are six[1] categories of projects under the CMAQ program and only the "Traffic Flow Improvements" category would likely affect the Annual Hours of Delay.

On-Road Mobile Source Emissions: The California Clean Air Act mandates the Air Resources Board to achieve the maximum degree of emissions reductions from all on- and off-road mobile sources in order to attain the State ambient air quality standards. This data is currently collected under Criteria Pollutant Emissions (see previous page).

New Performance Reporting

State Reporting on Performance Progress:

- Required initially by October 1, 2016, and every 2 years thereafter
- Report includes: Progress in achieving all State performance targets

CMAQ Performance Plan:

- Reporting required every 2 years
- Report on progress towards the achievement of targets.
- Plan to be completed by FHWA.

Metropolitan Performance Reporting:

- Required in transportation plan every 4 or 5 years
- Report includes:
    - Evaluate condition and performance of transportation system
    - Progress achieved in meeting performance targets in comparison with the performance in previous reports
    - Evaluation of how preferred scenario has improved conditions and performance, where applicable
    - Evaluation of how local policies and investments have impacted costs necessary to achieve performance targets , where applicable

Statewide Transportation Report:

- No required frequency
- Optional report on system performance

[1] The six categories include: Shared ride services, pedestrian and bicycle programs, traffic flow improvements, transit improvements, transportation demand management strategies, inspection and maintenance programs and other projects.

B-7. Congestion Performance Measurement Fact Sheet

August 2015

Congestion Performance Measurement

Overview

The Moving Ahead for Progress in 21st Century Act (MAP-21) focuses on data-driven performance measures that target outcomes. The Notice of Proposed Rulemaking (NPRM) for congestion performance has not yet been published, and as of July 2015, the NPRM is expected to be published in late-October 2015 with a comment period ending in late-January 2016.

Performance Measures

MAP-21 sets significant reduction in congestion on the National Highway System as a national performance goal. A NPRM for congestion reduction has not yet been issued, but a NPRM issued June 2, 2014, on "Statewide and Nonmetropolitan Transportation Planning; Metropolitan Transportation Planning"[1] ("Planning NPRM") may provide clues about its content. The planning NPRM asked planning agencies to include a congestion management process, based on measurements, and goals based on those measurements.

The planning NPRM proposed that congestion would be measured, acceptable levels of performance would be established, causes of recurring and non-recurring congestion would be identified, and management measures would feed into a decision-making process. The development of a congestion management process should result in multimodal performance measures and strategies.

A State highway program might take a similar approach as the planning NPRM. The planning NPRM does not focus heavily on system reliability, but it's likely that a State highway performance measurement system would favor both congestion and system reliability.

Current data collection

The California Department of Transportation (Caltrans) currently has an extensive network of highway detection in most metropolitan areas, and in all of the most congested areas of the State, in nine of the twelve districts. These detectors feed into a software tool called Caltrans Performance Measurement System (PeMS), which gathers information from these detection stations and enables analysis of highway performance.

PeMS is able to report on several areas of highway performance, such as speeds, congestion, corridor reliability, bottlenecks, and historical information is available for most types of reporting, enabling staff to analyze system performance over time, to determine whether issues are recurrent or non-recurrent. It is anticipated that Caltrans will be able to collect the information relevant to carry forward a congestion relief program.

Current congestion relief strategies

Caltrans currently addresses congestion relief through active traffic management, supported by the Traffic Management Centers, as well as issuing projects designed to reduce delay. State Highway

[1] Statewide and Nonmetropolitan Transportation Planning; Metropolitan Transportation Planning, 79 Fed. Reg. 31,784 (Jun. 2, 2014). http://www.gpo.gov/fdsys/pkg/FR-2014-06-02/pdf/2014-12155.pdf

Operation and Protection dollars are obligated to two major categories, through projects that are conceived at the district level, based on local priorities. The two categories are 1) operational improvements, which seek to reduce delay in spot locations, and 2) traffic management systems, which install and repair tools which help to manage traffic, such as highway detection stations, changeable message signs, and ramp meters.

B-8. Freight Performance Measurement Fact Sheet

August 2015

Freight Performance Measurements

Asset Type: Highway

Scope of Data Included in Performance Measure

Currently, little is known about which freight performance measures will be required when the Notice of Proposed Rule Making (NPRM) for Moving Ahead for Progress in the 21st Century (MAP-21) is announced. As of July 2015, the NPRM for Freight System Performance Measures is anticipated to be published in late-October 2015 with the comment period ending in late January 2016.

Background

Section 1203 of MAP-21 requires that the United States Department of Transportation (US DOT) will promulgate performance measures for the National Highway Performance Program (NHPP), Highway Safety Improvement Program (HSIP), the Congestion Mitigation and Air Quality Improvement Program (CMAQ) and "National Freight Movement for states to use to assess freight movement on the Interstate System."

The National Cooperative Freight Research Program Report (NCFRP), Report 10, Performance Measures for Freight Transportation (2011), states that State Department of Transportations (State DOTs) to date have had "little use for freight performance measures." The report further states that State DOTs are "challenged both by an abundance of data and by a lack of complete data for many important freight system performance functions." Within the California Department of Transportation (Caltrans), freight-related data associated with highways is mainly collected by the Division of Traffic Operations and the Division of Transportation Planning, Office of Multi-Modal System Planning.

Freight Performance Measures

At this time, Caltrans does not report on specific freight performance measures, although interim measures were included in the December 2014 California Freight Mobility Plan. In order to be prepared for the NPRM, the American Association of State Highway and Transportation Officials' (AASHTO) Standing Committee on Performance Management (SCOPM) created a Freight Task Force that made only two performance measure recommendations to the Federal Highway Administration (FHWA): 1) **Annual Hours of Truck Delay (AHTD)** and 2) **Truck Reliability Index (TRI)**. The Task Force noted that MAP-21 emphasizes "highways and trucks as opposed to a more mode neutral or multi-modal approach…" and also noted "the need to capture other aspects of freight movement, including system capacity and utilization… to reflect broader mobility and safety objectives." The Task Force also commented on the difficulty caused by the "ambiguity in the scope of application of the measures (statewide, regional, corridor)."

Definitions

- **Annual Hours of Truck Delay (AHTD):** Travel time above a state-determined threshold of what constitutes congestion in units of truck vehicle-hours on the Interstate Highway System. AHTD represents a summation of the amount of extra time (delay) in hours spent by trucks along

Interstate Corridors caused by congestion and/or other factors such as severe weather, safety inspections or roadway geometrics.

- **Truck Reliability Index (TRI):** The Truck Reliability Index (TRI) measures the consistency or dependability of travel times (including expected delay) between origin and destination, typically measured day-to-day or across different times of day.

ANNUAL HOURS OF TRUCK DELAY (AHTD)

AASHTO recommends that State DOTs and Metropolitan Planning Organizations (MPOs) should be given flexibility in target setting and in reporting using a percentage, for example "AHTD should not increase more than 5 percent per year," rather than reporting in qualitative variables such as good, fair, poor or similar ratings.

Data

AASHTO also recommends corridor segments would be identified by State DOTs and Federal Highway Administration (FHWA). An Agency-specified threshold speed would be determined by the State DOT or an MPO for the corridor segment. The Agency-specified speed will be a general designated speed, unless determined otherwise, and may change over time. Caltrans uses 35 miles per hour (mph) on freeways as a threshold speed to identify serious congestion problems. According to AASHTO's SCOPM, the freight vehicle miles traveled (VMT) would "have to be calculated using the FHWA Highway Performance Monitoring System (HPMS) average annual daily truck traffic (AADTT) and modified by both a daily and hourly truck factor determined by the State DOT." The travel speed could be a separate data set for passenger vehicles and trucks.

Methodology and Calculation for AHTD

Input Data

- **Corridor Segments:** Define Interstate Corridors to be analyzed for trucks consisting of an origin and destination. At a minimum, the corridor segments defined by the state would need to reflect congestion at freight bottlenecks and those corridors identified in the National Freight Strategic Plan located within the state.
- **Freight Vehicle Miles Traveled (VMT):** VMT needs to be available in appropriate units depending on the measurement being analyzed. For AHTD, the truck volume times the corridor length is the appropriate measure. Hourly values would be estimated for trucks for each of the 24 hours during each of the seven days of the average week.
- **Travel Speed:** Average speed of the trucks during the time period on the corridor segments. An hourly value would be calculated for each hour of the day and each corridor segment.
- **Agency-specified Threshold Speed:** This is the Agency-specified threshold speed for the analysis time period from which AHTD would be calculated. The threshold speed should account for the different aspects of slowing trucks on the Interstate including weather conditions, enforcement, work zones, congestion, or roadway geometrics. For example, the threshold speed could be free-flow (65 mph), posted speed (55 mph), maximum throughput speed (50 mph), severe congested speed (35 mph) or some other speed. Regardless, this is specified by the transportation agency.

$$\textit{Daily Truck Hours of Delay} = \frac{\textit{Freight VMT}}{\textit{Travel Speed}} - \frac{\textit{Freight VMT}}{\textit{Agency-specified Threshold Speed}}$$

Procedure

1. Establish corridor segment(s).
2. For each corridor segment, determine the Agency-specified threshold speed.
3. For each day and corridor segment, calculate the Daily Truck-Hours of Delay:
4. Sum the Daily Truck-Hours of Delay for each day of a week → Weekly Truck-Hours of Delay per Corridor Segment.
5. Multiply Weekly Hours of Delay per corridor segment by 52 →Annual Truck-Hours of Delay per Corridor Segment.
6. Sum the Annual Hours of Delay per corridor segment → Annual Truck-Hours of Delay.

Output Data

- AHTD per corridor segment
- AHTD Statewide for all corridor segments

TRUCK RELIABILITY INDEX (TRI)

As previously stated, the truck reliability index is defined as the ratio of the total truck travel time needed to ensure ontime arrival to the agency-determined threshold travel time (e.g., observed travel time or preferred travel time). It is the "time taken to traverse a fixed distance between origin and destination of the route and is not independent of the distance traveled." (AASHTO, SCOPM Task Force Findings on National-Level Performance Measures, 2012.) This measure can be used to measure and compare corridors of any length and can be used by the State and MPOs to compare segments of a corridor or system to determine if reliability improved or declined.

Data

Implementation of the truck reliability index is dependent on the US. DOT providing to State DOTs and MPOs private sector speed data and vehicle miles traveled from HPMS volume data and the respective analysis tools. Various existing federal databases and private sector data can be used to compute the TRI_{80}. The cost of historic data is relatively inexpensive compared to the cost of real-time data. However, timely, comprehensive, and high-quality data on freight shipments, flows, and services is important to assist and improve decision making for freight infrastructure operators and planners. The Office of Multi-Modal Planning within the Division of Transportation Planning anticipates that the Freight Model should be completed by fall 2016 and should be able to perform freight data calculations.

In addition, a percentile is chosen that most likely represents a typical congested freight congestion travel time along urban corridors. The AASHTO Task Force chose the 80_{th} percentile because the Strategic Highway Research Program 2 (SHRP2) determined that at the 95_{th} percentile, congestion was more likely due to non-routine events (such as extreme weather, law enforcement criminal investigations, etc.) instead of more common multi-lane injury and secondary crashes that can be affected by changes in infrastructure, policy actions, and operational strategies.

Methodology and Calculation for TRI

Input Data

- Corridor Segments: Definition of Interstate Corridors being analyzed for trucks consisting of an origin and destination. At a minimum, the corridor segments defined by the state would need to reflect congestion at freight bottlenecks and those corridors identified in the National Freight Strategic Plan located within the state.

- Time Intervals: The day is divided into 288 five-minute intervals (24 hours x (60/5) = 288 five minute intervals).
- Travel Time: Corridor segment length (miles) divided by average speed (mph).
- Agency-specified Threshold Speed: This is the agency-specified threshold speed for the analysis time period. The threshold speed should account for the different aspects of slowing trucks on the Interstate including weather conditions, enforcement, work zones, and congestion. For example, the threshold speed could be free-flow (65 mph), posted speed (55 mph), maximum throughput speed (50 mph), severe congested speed (35 mph) or some other speed. Regardless, this is specified by the transportation agency.

Procedure

1. Establish corridor segments and repeat Steps 2 through 6 below for each segment.
2. Determine the Agency-specified threshold speed for the corridor segment and calculate the agency travel time for the corridor segment.
3. Calculate the travel time for each five-minute time interval for each day of the calendar year (365) from HPMS data.
4. For each time interval, array the travel time.
    a. From these 365 calendar days, travel times are arranged in ascending order.
    b. From this list, the 80_{th} percent worst travel time is selected.
    c. This will be the Annual Average 80_{th} Percentile Travel Time for that 5-minute interval across all days.
    d. Repeat the same process for the other 287 five-minute intervals.
5. From Step 4, array the 288 Annual Average 80_{th} Percentile Travel Time values.
    a. Arrange them in ascending order.
    b. From the list, the 80_{th} percent worst travel time is selected.
    c. This will be the 80_{th} Percentile Travel Time.
6. Calculate corridor TRI.

$$\text{Truck Reliability Index}_{80} = \frac{80_{th}\text{ Percentile Travel Time}}{\text{Agency Travel Time}}$$

7. Weigh the individual corridor RI values by the number of truck-miles traveled in each corridor to determine a statewide average. This step requires volume data (truck vehicle miles traveled data) in addition to speed data and should be provided in the same manner as volume data is provided in the delay measure proposal.

Output Data

- Truck RI_{80} per Corridor Segment

Note: *Given a fixed travel distance between the origin and destination of a trip, speed and travel time are inversely related. Meaning, higher travel speeds result in lower travel times for a given commute distance and vice versa. Hence the RI can be calculated using the speed input as well.*

Threshold Setting

This measure uses the Agency-specified speed threshold as determined by State DOTs and MPOs to define the comparison standard. The speed thresholds could be based on several factors that the state considers appropriate such as corridor characteristics; local conditions; community opinion about the

desirability of additional capacity in a corridor; freight movement goals; rural/urban routes; capacity assumptions and/or level of potential investment required to achieve performance levels. By using one condition, the Agency-specified speed threshold, for both the reliability and delay measure simplifies the communication of the freight performance measure results (particularly with non-technical audiences) and supports the expectations of the local community as expressed in the threshold.

References

National Cooperative Freight Research Program Report (NCFRP), Report 10, Performance Measures for Freight Transportation, 2011.

SCOPM Task Force Findings on National Level Performance Measures, AASHTO Standing Committee on Performance Management, Task Force on Performance Measure, Development, Coordination and Reporting, November 9, 2012.

B-9. Safety Performance Measurement Fact Sheet

July 2015

Safety Performance Measurement

Overview

A key feature of the Moving Ahead for Progress in 21st Century Act (MAP-21) is the creation of a performance and outcome-based program that uses data driven performance measures to achieve national goals. In the area of safety, the national goal is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads. The data-driven methodology will require both the California Department of Transportation (Caltrans) and the California Metropolitan Planning Organizations (MPOs) to work in conjunction to develop goals that will further safety improvements statewide.

Notice of Proposed Rulemaking

The Federal Highway Administration (FHWA) issued a Notice of Proposed Rulemaking (NPRM) for the Highway Safety Improvement Program (HSIP) on March 11, 2014.[1] The comment period on the NPRM was extended to June 30, 2014, at which point Caltrans was able to send in their response to the rulemaking. As of July 2015, *a final rule is expected to be published in November 2015, which may differ from the NPRM.*

Additionally, a Federal Fiscal Year 2015 Omnibus Appropriations Bill directs the FHWA to establish separate safety performance measures for pedestrian and bicyclist fatalities and serious injuries.

Summary of Performance Measure

The NPRM covers multiple areas for improvement, but the safety-related measures are generalized as follows:

1. Serious injuries per 100 million Vehicle Miles Traveled (VMT) on all public roads
2. Fatalities per 100 million VMT on all public roads
3. Number of serious injuries on all public roads
4. Number of fatalities on all public roads

Performance Measure Calculation Detail

The NPRM states that the number of fatalities would be determined from the National Highway Traffic Safety Administration's (NHTSA)'s Fatality Analysis Reporting System (FARS), which receives California-specific data from the California Highway Patrol's (CHP) Statewide Integrated Traffic Records System (SWITRS). FARS contains SWITRS fatality data for all public roads, however it is Caltrans' understanding that there may be some California jurisdictions that do not enter data into SWITRS because of non-standard accident reporting forms.

The NPRM states that the number of serious injuries is to be determined by "State reported data", and that the serious injury performance measure will ultimately need to conform to the Model Minimum Uniform Crash Criteria (MMUC). Serious injury data is also collected through CHP's SWITRS program;

[1] National Performance Management Measures; Highway Safety Improvement Program, 79 Fed. Reg. 13846 (Mar. 11, 2014). https://www.federalregister.gov/articles/2014/03/11/2014-05152/national-performance-management-measures-highway-safetyimprovement-program

The California Office of Traffic Safety (OTS), within the California State Transportation Agency (CalSTA), is working with the U.S. Department of Transportation Traffic Records Coordinating Committee to determine if SWITRS is MMUC compliant.

Rate performance measures (i.e., fatalities and serious injuries per 100 million VMT) would be measured as reported by Caltrans to the FHWA Highway Performance Monitoring System (HPMS). Caltrans Division of Research Innovation and System Information (DRISI) currently submits travel volume data for both the State Highway System (through the Traffic Census program) and non-state roads to HPMS. DRISI collects this traffic volume data under contract and also receives data from some local agencies; however, there are significant discrepancies and gaps with regard to the traffic volume data Caltrans currently collects and reports – particularly with regard to local roads.

Each performance measure is based on a 5-year rolling average, rounding the total to the hundredth decimal place.

Establishing Performance Targets

The NPRM encourages state Departments of Transportation (state DOTs), including Caltrans, to set performance targets that represent improvements in both the number and rate of fatalities and serious injuries. Targets will represent statewide performance, but separate targets may also be set for urban and rural areas (historically, Caltrans Traffic Census has established boundaries between rural and urban areas).

State DOTs must set safety performance targets for the following year in their annual HSIP report to FHWA (and they must also be included in the statewide transportation improvement program under 23 USC § 135(g)(4)). State DOT HSIP performance targets must be identical with State Highway Safety Office (in California, the OTS) targets reported annually to NHTSA in the State Highway Safety Plan, and as coordinated through the State Strategic Highway Safety Plan.

MPOs shall establish their own targets no later than 180 days after the Caltrans HSIP annual report. MPO targets will be reported to State DOTs and made available to FHWA upon request. Additionally, performance targets should be included in both metropolitan transportation plans (23 USC § 134 (i)(2)(B)) and transportation improvement programs (23 USC § 134(j)(2)(D). Metropolitan transportation plans must include a description of the performance measures and targets used in assessing transportation system performance, while the transportation improvement program must describe the effect of achieving performance targets and link investment priorities to those targets.

State DOTs and MPOs are required to coordinate target setting to the maximum extent practicable.[2]

Timelines

The FHWA requires Caltrans to establish statewide targets not later than one year after the effective date of the final rule, and begin reporting this target information in the HSIP annual report due August 31 following the effective date of the final rule.

[2]The NPRM anticipates that MPOs serving populations less than 200,000 will likely adopt State DOT targets rather than establish their own safety performance targets.

Accountability Measures

If a State has not met or made significant progress toward meeting its targets within two years of their establishment, the State must use an amount of its formula obligation limitation equal to its prior year HSIP apportionment only for obligation of its HSIP funding. Additionally, the State must submit an annual implementation plan on how the State will make progress to meet performance targets (23 USC § 148(i)).

Special Rules:

- *High Risk Rural Road (HRRR) Safety* – An HRRR is any rural major or minor collector or a rural local road with significant safety risks, as defined by a state in accordance with an updated State Strategic Highway Safety Plan. If the fatality rate on such roads increases over the most recent 2-year period for which data are available, in the next fiscal year the state must obligate for this purpose an amount at least equal to 200 percent of its FY 2009 HRRR set-aside.[3]
- *Older drivers* – If fatalities and serious injuries per capita for drivers and pedestrians over age 65 increases during the most recent 2-year period for which data are available, a state is required to incorporate strategies focused on older drivers and pedestrians in the next State Strategic Highway Safety Plan update.

Caltrans comments on this NPRM

Caltrans submitted several comments on the NPRM after soliciting stakeholder feedback. First, Caltrans notes that that the fatality and serious injury performance measure data will likely be derived from CHP SWITRS. However, incident information from SWITRS is not always immediately accurate and must be vetted; and there is a time gap between the date of the incident and the date when the SWITRS information is available for research. Efforts are being made to improve the timeliness and quality of SWITRS data, but it currently affects our ability to establish meaningful performance targets.

Additionally, Caltrans notes that the FHWA definition of serious injuries may be different than the standard used in California. If it is, hundreds of police, sheriff, and CHP offices may need to retrain their staff to adhere to the new definition, which would be both time consuming and costly. Additionally, it would impact the ability to compare historical data to new information collected.

The NPRM also recommends that by 2020, states determine serious injuries using a hospital records injury outcome reporting system. It may be difficult for Caltrans to establish a link between the hospital data systems and our own system by that time.

Finally, approximately 90 percent of California's public roads are on the local roadway system, and only 10 percent are on the State Highway System. More than half of California's roadway fatalities (60 percent) occur on the local roadway system, where information such as roadway features, traffic volumes, and road miles – needed to accurately calculate fatality and serious injury rates - are not always available. Caltrans will need to coordinate closely with local agencies to collect and accurately report this data, which will take time and require financial resources.

[3]The HRRR program was a Federal statutory funding set-aside that existed prior to MAP-21.

Additional Resources

Caltrans MAP-21 Implementation Website:
http://www.dot.ca.gov/hq/transprog/map21_Implementation.htm

FHWA Transportation Performance Management Website:
http://www.fhwa.dot.gov/tpm/

FHWA MAP-21 Fact Sheet on Performance Management:
http://www.fhwa.dot.gov/map21/factsheets/pm.cfm

FHWA MAP-21 Fact Sheet on Highway Safety Improvement Program:
http://www.fhwa.dot.gov/map21/factsheets/hsip.cfm

B-10. Highway Safety Improvement Program Performance Measurement Fact Sheet

July 2015

Highway Safety Improvement Program

Overview

The Moving Ahead for Progress in 21st Century Act (MAP-21) continues the Highway Safety Improvement Program (HSIP) to achieve a significant reduction in traffic fatalities and serious injuries on all public roads.

Notice of Proposed Rulemaking

The Federal Highway Administration (FHWA) issued a Notice of Proposed Rulemaking (NPRM) for the HSIP on March 28,2014.[1] The comment period on the NPRM was extended to June 30, 2014, at which point Caltrans was able to send in their response to the rulemaking. As of July 2015, the final rule is expected to be published in October 2015.

Summary of HSIP Changes

The most significant change in the NPRM is the requirement to establish a Model Inventory of Roadway Elements (MIRE) fundamental data elements (FDE) for all public roads (required by section 1112 of MAP-21 that amends 23 U.S.C. §148(f)).

The NPRM discusses the 5-year Strategic Highway Safety Plan (SHSP) update cycle, as well as the requirement to submit HSIP reports on an annual basis via online reporting tool, which will facilitate review and evaluation of the reports.

The NPRM also proposes to amend U.S. Department of Transportation (U.S. DOT's) regulations to conform to MAP–21 statutory provisions that removed the requirement for states to prepare a Transparency Report, the High Risk Rural Roads set-aside, and the 10 percent flexibility provision for states to use safety funding in accordance with federal law.

The comment period for this NPRM is closed and the proposed rule may change prior the final rule being published in the Code of Federal Regulations.

Model Inventory of Roadway Elements

The NPRM requires that states establish a MIRE FDE by September 30, 2020. The MIRE FDE is a comprehensive data set, including roadway geometrics, roadway features, and traffic information, which can be used to do advanced safety analysis. A linear referencing system (LRS) is used to locate MIRE FDE inventory on the state highway system, and is an optional, but suggested, extension to be applied to all public roads in the state. For roads with less than 400 average annual daily traffic, a reduced set of MIRE FDEs will need to be collected.

While the FHWA is not proposing requirements for how states must collect and process the proposed MIRE FDE, FHWA envisions that states would do so using a variety of means, tools and technology, including, but not limited to: Data mining existing resources (e.g., existing state-maintained roadway

[1] Highway Safety Improvement Program, 79 Fed. Reg. 17,464 (Mar. 28, 2014). http://www.gpo.gov/fdsys/pkg/FR-2014-03-28/pdf/2014-06681.pdf

inventories, as-built plans, and construction records), ground-based imaging (e.g., driving along roads and using mobile mapping and LiDAR), and aerial imaging (both with and without LiDAR). In addition, FHWA's NPRM notes that state Departments of Transportation may need to work with local transportation authorities to collect the MIRE FDE.[2] A description of various methodologies for collecting MIRE FDE is provided in the MIRE Data Collection Guidebook.[3]

The MIRE FDE elements will need to be continually updated, once the initial data collection has been completed. Route realignments, roadway modifications, degradation of facilities, and changes in driver behavior are examples of factors that can change over time, requiring an update of the MIRE FDE.

Highway Safety Improvement Program Report

Minimal changes were suggested to the HSIP report content in the NPRM. States are still required to develop, implement, and evaluate an annual HSIP that has the objective to significantly reduce fatalities and serious injuries resulting from crashes.

Timelines

The FHWA NPRM requires Caltrans to incorporate an implementation plan for the collection of MIRE FDE by July 1, 2015, and complete collection of all MIRE FDE on all public roads is to be completed by September 30, 2020.

Annual HSIP reports are to be submitted no later than August 31 for the previous reporting year.

States are to update their SHSP no later than every five years from the date of the previously approved version.

Caltrans comments on this NPRM

Caltrans submitted several comments on the NPRM.[4] The requirement to have an implementation plan for collecting the MIRE FDE by July 2015 is overly ambitious. More time is necessary to coordinate statewide with all other parties that will be involved because of the size of the state and the scope of the data collection.

The collection of the MIRE FDE on all public roads in five years is an aggressive schedule, especially for the collection of data on the local road system. The local road system in California contains over 140,000 miles of roadway. Caltrans believes that ten years would be a more appropriate schedule for this effort, given the magnitude.

The collection of accident data statewide will be a difficult undertaking. Approximately 60 percent of California's highway fatalities occur on the local roadway system, where it is difficult to gather information. Compiling High Collision Concentration Locations will be difficult without access to a statewide LRS, and it is unknown what other data gaps might exist, or what collaboration challenges might arise. Funding, flexibility, and time will be needed to adequately accomplish the goals of the NPRM.

[2] *Id*. at 17,471.
[3] http://safety.fhwa.dot.gov/rsdp/downloads/datacollectionguidebook.pdf
[4] http://www.dot.ca.gov/hq/transprog/map21/NPRM/Comment%20Letters/Caltrans%20Comments%20on%20the%20Highway%20Safety%20Improvement%20Program%20Rulemaking.pdf

The NPRM estimates that it would cost an average state $1,362,000 to complete LRS and initial MIRE FDE collection, including $66,000 for management and administrative costs and $225,000 annually for maintenance costs. The costs will likely be significantly higher for California because of the vast local roadway network and the significant data gaps on the local roadway system. However, even for an average state Caltrans believes the costs have been vastly understated.

Additional Resources

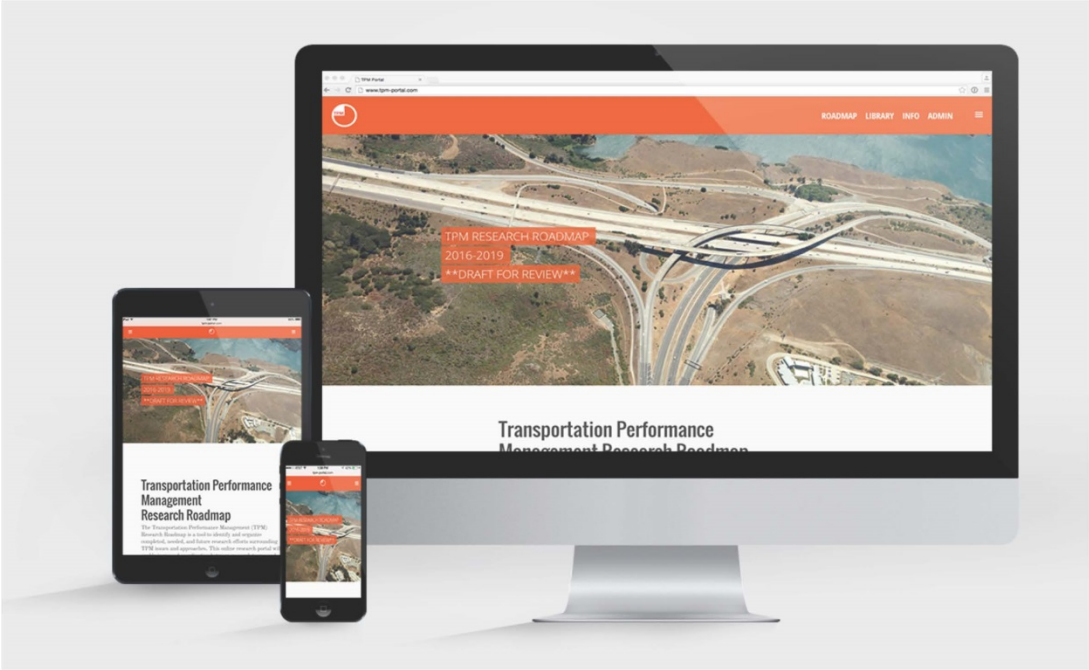
Caltrans MAP-21 Implementation Website:
http://www.dot.ca.gov/hq/transprog/map21_Implementation.htm

B-11. Transportation Performance Management Research Roadmap

The original file for this handout can be found here:
http://www.dot.ca.gov/hq/transprog/map21/forums_and_workshops/map21_data-asmt/Research%20Roadmap%20Flyer%20NCHRP%2020-24(97).pdf

Transportation Performance Management Research Roadmap

Advancing Performance Management Under a National Framework



The AASHTO Standing Committee on Performance Management (SCOPM) is supporting an effort to develop a transportation performance management (TPM) research roadmap to inform future research and development activities to be undertaken by the transportation industry. The roadmap has been developed through a series of workshops and other activities conducted as part of NCHRP Project 20-24(97). The roadmap is hosted online and connected to a database of recent TPM research, providing an integrated entry point for practitioners to access a wide range of information on current, recent, and potential future TPM research. The Roadmap is a living document, intended to be regularly updated to provide a snapshot of the research status and needs surrounding TPM at a given time. In the coming years, the roadmap will be updated on an ongoing annual basis.

Visit the site to learn more: **http://www.tpm-portal.com**

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About the Research Roadmap Website

The TPM Research Roadmap is a tool to identify and organize completed, needed, and future research efforts surrounding TPM issues and approaches. This online research portal will enable increased coordination between research teams and AASHTO or TRB panel partners.

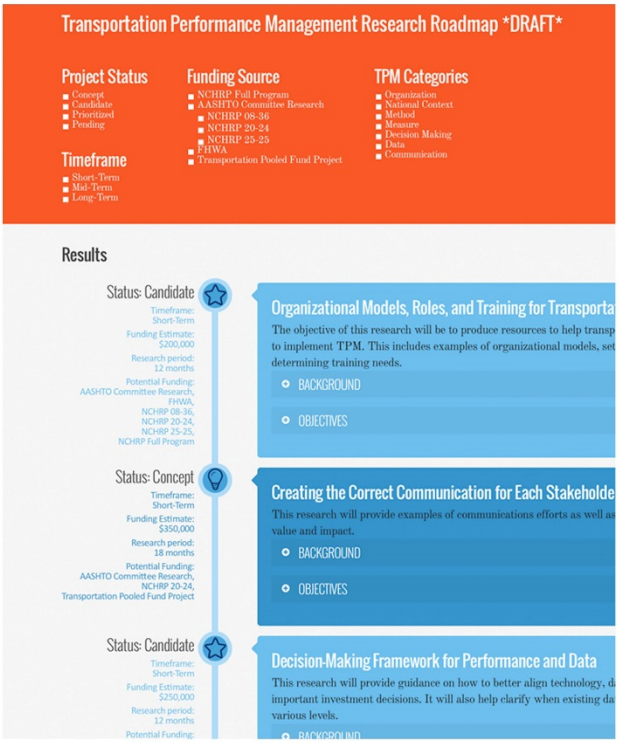
Researchers and practitioners alike can use the portal to help identify and respond to challenges and opportunities associated with the preparation and application of national-level transportation system performance information.

In the near term, the Roadmap will offer a consolidated set of resources on performance management. Transportation practitioners can use the Roadmap website to help plan future research and development activities to be undertaken by the transportation industry.

Over the long term, the Roadmap will help identify challenges and opportunities associated with preparation of national-level transportation system performance information – and identify research needs to improve the state of the practice in TPM.

TPM Research Roadmap

- Roadmap contains research statements for potential research projects
- Query tools enable custom views (by funding source, timeframe, etc.)
  - Roadmap view displays:
    - **Current status** (concept, candidate, prioritized, pending, active, completed)
    - **Timeframe** (short-, mid-, and long-term)
    - **TPM Categories** (organization, national context, methods, measures, decision making, data, communications) (not shown in this view)
    - **Estimated funding required**
    - **Estimated research period**
    - **Potential funding sources**
    - **Research title and summary**
    - **Research objectives**
- Each entry links to a detailed project page



Visit the site to learn more: **http://www.tpm-portal.com**

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B-12. Office of Transportation Performance Management Fact Sheet

The original file for this handout can be found here:
http://www.dot.ca.gov/hq/transprog/map21/forums_and_workshops/map21_data-asmt/pmfactsheet%20handout.pdf

Office of Transportation Performance Management

FACT SHEET

Pavement and Bridge Condition Performance Measures (PM)

Notice of Proposed Rulemaking (NPRM)

The Moving Ahead for Progress in the 21st Century Act (MAP-21) requires the Secretary to develop new regulations (23 CFR 490) to establish Transportation Performance Management (TPM) requirements for the purposes of carrying out the National Highway Performance Program (NHPP). The Pavement and Bridge Condition PM NPRM was published on January 5, 2015 and the deadline for comments is April 6, 2015. The NPRM may be found in docket number FHWA-2013-0053 at https://federalregister.gov/a/2014-30085.

A recently paved highway in Utah.

Summary of Major Provisions

References below refer to proposed sections of the regulatory text for Part 490 of Title 23 of the Code of Federal Regulations (CFR):

PART 490 - National Performance Management Measures

Subpart A - General Information

101 Definitions

103 Data requirements

105 Establishment of performance targets

107 Reporting on performance targets

109 Assessing significant progress

111 Incorporation by reference

Subpart C - National Performance Management Measures for Assessing Pavement Condition

301 Purpose

303 Applicability

305 Definitions

307 Pavement condition measures

309 Data requirements

311 Calculation of pavement metrics

313 Calculation of performance management measures

315 Minimum level for condition of pavements

317 Penalties for not maintaining pavement condition

319 Other requirements

Subpart D - National Performance Management Measures for Assessing Bridge Condition

401 Purpose

403 Applicability

405 Definitions

407 Bridge condition measures

409 Calculation of bridge condition measures

411 Minimum level for condition of bridges

413 Penalties for not maintaining bridge condition

Summary of Proposed Rulemaking

As part of the Pavement and Infrastructure Condition PM NPRM, the Federal Highway Administration (FHWA) proposes measures to assess the condition of pavements and bridges on the National Highway System (NHS). Under the proposed rule, FHWA also proposes the process for States and Metropolitan Planning Organizations (MPOs) to establish and report on performance targets reflecting the proposed measures, and the methodology to evaluate whether a State has made significant progress toward achieving those targets. Finally, FHWA proposes a minimum level for the condition of pavement on the Interstate System and incorporates the minimum condition level established by MAP-21 for bridges on the NHS.

Proposed Pavement Condition Measures: FHWA proposes measures that would be applicable to all mainline Interstate System and non-Interstate NHS pavements regardless of ownership or maintenance responsibility of roads within a given State or metropolitan planning area. FHWA proposes four measures for pavement condition:

Interstate System	Non- Interstate NHS System
Percentage of pavements in Good condition	Percentage of pavements in Good condition
Percentage of pavements in Poor condition	Percentage of pavements in Poor condition

Proposed Minimum Level for Condition of Pavements: States would need to maintain no more than 5 percent of lane miles of their pavements on the Interstate System in Poor condition. States not meeting this requirement for two consecutive years will be subject to penalty provisions including obligating NHPP funds and transferring Surface Transportation Program funds.

Proposed NHS Bridge Condition Measures: FHWA proposes measures that would be applicable to all NHS bridges regardless of ownership or maintenance responsibility within a given State or metropolitan planning area including bridges on ramps connecting to the NHS and NHS bridges that cross a State border. FHWA proposes two measures for bridge condition:

NHS	
Percentage of bridges in Good condition	Percentage of bridges in Poor condition

Minimum Level for Condition of NHS Bridges: States will need to maintain bridges on the NHS so that the percentage of the deck area of the bridges classified as Structurally Deficient does not exceed 10 percent of the overall deck area in a State. If for 3 consecutive years the minimum condition level is not met, the State must set aside and obligate NHPP funds for eligible projects on bridges on the NHS.

Proposed Process for Establishing Targets: Under the NPRM, States would establish statewide targets for each of the pavement and bridge condition measures for a 4-year performance period. The targets would be established in coordination with relevant MPOs, to the maximum extent practicable. States could establish additional targets for any number and combination of urbanized areas and could establish a target for the non-urbanized area for any or all of the proposed measures. States would be required to establish targets within one year of the effective date of the final rule and report them in the first biennial performance report due to FHWA by October 1, 2016. States would report their established targets (2-year, where applicable, and 4-year) and progress toward achieving those targets in subsequent biennial performance reports. States would have the ability to adjust a 4-year target at the midpoint of a performance period. MPOs would establish 4-year targets for the same measures within 180 days after the State establishes each target. The targets would be established in coordination with the State, to the maximum extent practicable. The MPO could either agree to support the State target or establish a quantifiable target specific to the MPO planning area.

The new Woodrow Wilson bridge connecting Maryland and Virginia.

Proposed Target Assessment Process: The NPRM calls for FHWA to biennially assess progress made by each State in achieving each of the targets they have established for the NHPP. State progress would be considered significant if the actual condition is either:

- equal to or better than the establish target or
- better than the baseline condition.

Proposed Consequences: If a State has not made significant progress towards the achievement of a target in two consecutive FHWA determinations, then the State would be required to include in the next biennial performance report a description of the actions the State will undertake to achieve all related NHPP targets.

Credits:

Photographs courtesy of FHWA

Additional Information:

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www.fhwa.dot.gov/tpm/

NPRM Docket Number:
FHWA-2013-0053
Publication Number:
FHWA-HIF-15-003

Please note:
Comments will be accepted on the NRPM through April 6, 2015.

January 2015

U.S. Department of Transportation
Federal Highway Administration

B-13. MAP-21 Putting Performance into Action

MAP-21
Putting Performance into Action

Transportation Performance Management Process

Moving Ahead for Progress in the 21st Century Act (MAP-21) creates a performance-based and multimodal program to strengthen the U.S. transportation system. By focusing on national goals, increasing accountability, and improving transparency, these changes will improve decision-making through better informed planning and programming.

The U.S. Department of Transportation (USDOT) is implementing the new MAP-21 performance requirements through a number of rulemakings released in several phases.

Resources:
www.dot.gov/map21
www.fhwa.dot.gov/tpm/

Contact Us:
Performancemeasures rulemaking@dot.gov

USDOT Implementation of MAP-21 Performance Provisions: Ten Interrelated Rules

		2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	2015 Q2	2015 Q3	2015 Q4
Planning									
Metropolitan and Statewide Planning Rule	• Establish a performance-based planning process at metropolitan and state level. • Define coordination in the selection of targets, linking planning and programming to performance targets.								
Highway Safety									
Safety Performance Measure Rule	• Propose and define fatalities and serious injuries measures, along with target establishment, progress assessment and reporting requirements. • Discuss the implementation of MAP-21 performance requirements.								
Highway Safety Improvement Program (HSIP) Rule	• Integration of performance measures, targets, and reporting requirements into the HSIP. • Strategic Highway Safety Plan updates.								
Highway Safety Program Grants Rule * * Interim Final Rule issued by NHTSA in January 2013.	• State target establishment and reporting requirements. • Highway safety plan content, reporting requirements, and approval.								
Highway Conditions									
Pavement and Bridge Performance Measure Rule	• Propose and define pavement and bridge condition measures, along with minimum condition standards, target establishment, progress assessment and reporting requirements.								
Asset Management Plan Rule	• Contents and development process for asset management plan. • Minimum standards for pavement and bridge management systems.								
Congestion/System Performance									
System Performance Measure Rule	• Define performance of the interstate system, non-interstate national highway system, and freight movement on the interstate system. • Finalize interpretation of scope of CMAQ performance requirements, including congestion and on-road mobile source emissions. • Summarize MAP-21 highway performance measure rules								
Transit Performance									
Transit Asset Management Rule	• Define state of good repair and establish state of good repair performance measures • Require transit providers to set targets and report on progress • Transit asset management plans								
National Transit Safety Program Rule	• Define transit safety criteria and standards • Include definition of state of good repair								
Transit Agency Safety Plan Rule	• Transit safety plan content and reporting requirements • Target setting requirements for transit agencies and States								

Anticipated 2015 Final Rule Publication

Indicates the comment period

Appendix C. Presentations

Visit http://www.dot.ca.gov/hq/transprog/map21/map21_presentations.html for the following presentations from the two-day workshop:

- Introduction and Welcome (Giles Giovinazzi)
- Implementation of Performance Provisions Updates and Data Challenges (Peter Stephanos)
- Leveraging Data to Tell a Performance Story: Previewing the MAP-21 Road Ahead via MTC's Vital Signs Initiative (Dave Vautin)
- Local Agency Remarks (Dan Landon)
- Asset Management Overview (Michael B. Johnson)
- Bridge Asset Performance Measure (Mike Johnson)
- MAP-21 Proposed Pavement Requirements for NHS (Tom Pyle)
- Culvert Inspection & Maintenance (Parviz Lashai)
- Intelligent Transportation System (ITS) Elements (Matt Friedman & Brian Simi)
- Risk Mitigation Plan Development (Shanna Everts & Eric Strader)
- California Linear Referencing System (LRS) Pooled Fund Study (Mark Samuelson)
- Congestion Mitigation and Air Quality (CMAQ) (Dennis Jacobs)
- System Performance (Rich Stone)
- Freight Performance Measures (Joanne McDermott)
- Highway Safety Improvement Plan and Safety Performance Measures (Thomas Schriber)
- National Perspective: Data for MAP-21 Transportation Performance Management (Frances Harrison)

Appendix D. Attendees

Federal Agencies

FHWA
Rick Backlund, Associate Division Administrator (CalSouth)
Joseph Hausman, HPMS Program Review Coordinator
Peter Stephanos, Director, Office of Performance Management

FHWA California Division
Mike Duman, Chief Operating Officer
Steve Healow, Asset Management & Pavement Engineer
Vivien Hoang, Operations/ITS Team Leader
Aimee Kratovil, Director of Performance Management
Jack Lord, Planning & Air Quality Team Leader
Vince Mammano, Division Administrator
Wesley Rutland-Brown, Data Analyst
Matt Schmitz, Director, Project Delivery
Paul Schneider, Nevada Assistant Division Administrator
Arianna Valle, Safety/Ops Engineer

State Agencies

California Department of Motor Vehicles
Sladjana Oulad Daoud, Research Manager II

California Highway Patrol
Dalila Fontana, Data Processing Manager
Carolyn Gaynor, Staff Services Manager
Jennifer Mercado, Staff Services Manager
Isaac Tillman, Commander, Support Services Section

Caltrans
Jim Appleton, Supervising Transportation Surveyor, Division of Engineering Services (DES)
Chad Baker, Supervising Transportation Engineer, Division of Research, Innovation, and System Information (DRISI)
Katie Benouar, Chief, Division of Transportation Planning (DOTP)
Jeffrey Benowitz, C.E.A. Range-C, Division of Legal
Jesse Bhullar, Principal Transportation Engineer, Division of Maintenance
Coco Briseno, C.E.A. Range-B, Deputy of Planning and Modal Programs
Christian Bushong, Senior Transportation Planner, DOTP
Nieves Castro, Supervising Transportation Planner, District 3 Planning and Local Assistance
Chingsou Chervunkong, Research Analyst II GIS, DRISI
Chitra Chitturi, Data Processing Manager III, Division of Information Technology
Mandy Chu, Supervising Transportation Engineer, DRISI
Ron Clemens, Data Processing Manager III, Division of Information Technology
Paul Cooley, Senior Bridge Engineer, Division of Maintenance
David Cortez, Senior Transportation Planner, Division of Project Management
Silva Dayak, Associate Transportation Planner, Division of Project Management

Caltrans (continued)
Hau Doan, Transportation Engineer, DRISI
Brian Domsic, Senior Transportation Engineer, Supervisory, DRISI
Malcolm Dougherty, Director
John Ensch, Senior Transportation Engineer, Division of Traffic Operations
Fardad Falakfarsa, Principal Transportation Engineer, Division of Budgets
Matthew Friedman, Senior Transportation Planner, Division of Traffic Operations
David Giongco, Senior Transportation Engineer, Office of Enterprise Risk Management
Giles Giovinazzi, Federal Transportation Liaison, Office of the Director
Lonora Graves, Senior Transportation Planner, DOTP
Huilan Han, Research Analyst I, DOTP
Timothy Hart, Senior Transportation Planner, Division of Traffic Operations
Joe Holland, Senior Transportation Engineer, DRISI
John Hoole, Supervising Transportation Engineer, Division of Local Assistance
Dennis Jacobs, Senior Transportation Engineer, DOTP
Michael Johnson, Principal Transportation Engineer, Office of the Director
Soheila Khoii, Research Manager II, DOTP
Andy Knapp, Associate Transportation Planner, DOTP
Parviz Lashai, Supervising Transportation Engineer, Division of Maintenance
Bennie Lee, Associate Transportation Planner, DOTP
Nate Lyday, Risk Analyst, Office of Enterprise Risk Management
Kathryn McAlpin, Risk Analyst, Office of Enterprise Risk Management
Joanne McDermott, Senior Transportation Planner, DOTP
Quyen Ngo, Transportation Engineer, DRISI
Hiep Nguyen, Transportation Engineer, DRISI
Ivy Nguyenphan, Transportation Engineer, DRISI
Vahid Nowshiravan, Transportation Engineer, DOTP
Debbie Nozuka, Associate Transportation Planner, DOTP
Robert Peterson, Local HSIP Program Manager, Division of Local Assistance
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Appendix E. Best Practices for Data Inventory/Self-Assessment

The following is a white paper prepared by Kendra Levine, the Research, Outreach, and Web Services Librarian for the UC Berkeley Institute of Transportation Studies.

Best Practices for Data Inventory/Self-Assessment

Kendra K. Levine, April 2015

The current transportation authorization bill, Moving Ahead Progress in the 21st Century Act (MAP-21)[1], was signed into law on July 6, 2012. The legislation uses performance measures and targets to improve the safety and efficiency of the nation's transportation system. The legislation mandates state departments of transportation (DOTs) to conduct programmatic data self-assessments and inventories to ensure that they have the necessary data to accurately monitor the performance of the transportation system.

Many state DOTs are currently preparing to perform the data self assessments but are also waiting for the required targets and performance measures from MAP-21 to be formalized. The federal rulemaking process is currently underway but the timeline for completion has not yet been finished and will likely be delayed. There is also a NCHRP project developing guidelines for agencies to perform data self-assessments for MAP-21, the final report should be published in May 2015.

MAP-21 Requirements

A key innovation in MAP-21 is the focus on performance and outcome based measures. The legislation establishes national goals that the States collectively work towards. MAP-21 sets forth seven different goal areas for the Federal-aid highway program; safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays. Performance targets for these measures are outlined in §1203; 23 USC 150 of the legislation.

The notice of proposed rulemaking (NPRM) for performance management measures was issued on March 11, 2014.[2] The extended comment period has ended and the final rule will be issued in September 2015. Preliminary targets rely on data states are already required to collect for FARS and HPMS (Section 490.211(a)), with an emphasis on safety metrics such as fatalities. FHWA recognizes that states may establish one set of performance measures for urbanized areas and another for non-urban areas as defined by the Census (490.209(a)).

Data Assessment

Today organizations are reliant on data to carry out operations. Data is required for decision making, performance metrics, and planning so assurance of the quality of the data program is critical. Self-assessment is an important component of a data management program to ensure

[1] http://www.dot.gov/map21

[2] https://federalregister.gov/a/2014-05152

the necessary data is being collected and used appropriately. Assessing data quality using a multidimensional approach has been used for more than a decade[3], and this method was tailored for transportation agencies in *NCHRP 08-36, Task 100 Transportation Data Self Assessment Guide*.[4] The report splits key data assessment categories into three topic areas; strategic alignment, data program management processes, and data quality.

Table 1.1. Key Assessment Categories and Topic Areas[5]

Strategic Alignment ● Alignment with strategic goals ● Clear and appropriate organizational roles ● Identification of data sources, uses, and users ● Data utilization and visualization	**Data Quality** ● Accuracy ● Consistency ● Reliability ● Timeliness ● Completeness ● Currency ● Integrity ● Confidentiality
Data Program Management Processes ● Clear definitions ● Ability to segregate, aggregate, and analyze ● Time and resources for conducting analysis and visualization ● Regular audits and validation procedures ● Consideration for program trade-offs, costs, and life-cycles ● Mechanisms for security, privacy, and ethical considerations ● Data collaboration ● Management continuity	

The NCHRP framework is a three-step process based on the IBM data governance maturity model, where governance evolves from an initial, reactive state to an optimized, continually improved process.[6] The steps are preparation of the project, gap analysis, and then plan development and implementation.

Preparation: To prepare for an assessment a project team is assembled with representation from stakeholders across the organization. This group should define goals that are both achievable and realistic, and will also result in desired outcomes. One of the key steps in preparation for an assessment is performing an inventory of the data program. The inventory documents what data programs exist in the agency and how data is generated, used, and

[3] "Data quality Assessment"; Pipino, L.L., Lee, Y.W., Wang, R.Y.; *Communications of the ACM*, v. 45, no. 4, April 2002 http://dx.doi.org/10.1145/505248.506010

[4] *NCHRP 08-36, Task 100 Transportation Data Self Assessment Guide*; Secrest, C., Schneiweis, K., Yarbrough, G.; August 2011 http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP08-36(100)_FR.pdf

[5] *ibid*. p. 2

[6] *The IBM Data Governance Council Maturity Model: Building a roadmap for effective data governance*, p. 7 October 2007, http://www-935.ibm.com/services/uk/cio/pdf/leverage_wp_data_gov_council_maturity_model.pdf

managed within the organization. From the established goals the team should then prioritize the inventoried data programs for assessment.

Gap Analysis: Once the inventory is complete and the goals and priorities are determined, a gap analysis should be performed using "maturity scales" to describe performance levels of individual data programs. First an agency needs to assess the current status of the data program and then set targets of the desired (optimal) maturity interval a data program needs to achieve for each applicable assessment category. To perform the actual gap analysis, and determine the required investments and policy changes to accomplish the stated goals, it is recommended that some sort of database tool be used.

Plan Development and Implementation: Once an agency has an understanding of the current state of their data programs and areas they need to improve, they can then plan the way forward. Using the priorities determined during preparation, the agency sets forth a plan to achieve the stated goals. The plan should consider required time, staffing, and budget and address necessary procedures, management processes, organizational roles, definitions, monitoring, and data availability. Then the agency will need to implement that plan, making sure to include outreach, human resources, and enforcement of the plan. NCHRP 08-36, Task 100 tested this proposed framework through case studies from four states; Arkansas, Iowa, New York, and Montana.

Implementation of this sort of data program self-assessment is currently being documented in another NCHRP project: 08-92 Implementing a Transportation Agency Data Self Assessment.[7] At the time of writing, the project has not yet completed but the final report should be published in May 2015. Five state DOTs were used as case studies; Colorado, Maryland, Kentucky, Minnesota, and Oregon. Spy Pond Partners also interviewed 12 MPO and DOT executives about their data programs.[8]

National Response

The federal response to MAP-21 has largely come from the modal administrations of FHWA, FTA, PHMSA, and FMCSA. USDOT has provided a broad overview of the legislation and the approval process.

FHWA's MAP-21 website[9] provides a number of a number of resources and guidance for agencies to adapt to the new legislation. Their series of Fact Sheets give brief overviews of many of the key project areas that are affected[10], however data assessment and data programs are not explicitly referenced. "Data-driven" methods are stressed for the Highway Safety

[7] http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3399

[8] http://onlinepubs.trb.org/onlinepubs/conferences/2014/NATMEC/Harrison.pdf

[9] http://www.fhwa.dot.gov/map21/

[10] http://www.fhwa.dot.gov/map21/factsheets/

Improvement Program (HSIP) but the requirements of the data program are left unstated.[11] Guidance is provided for collection of element level data for National Highway System Bridges, but no other data areas are addressed in such detail.[12] Data for the areas of Asset Management and Performance Measures are by nature cross cutting and touch on a number of programs addressed in MAP-21:

- Congestion Management and Air Quality (CMAQ)
- Safety
- Bridge
- Freight
- Pavement
- System Performance

FHWA is working with state DOTs to communicate the programmatic needs and establish standards and goals that are feasible across the country.

AASHTO's Standing Committee on Performance Management (SCOPM) convened a Task Force on Performance Measure Development, Coordination, and Reporting to help states meet MAP-21's new rules. They hosted a target-setting workshop in June of 2013.[13] Sessions were dedicated to each of the program areas listed above. While data assessment was not fully addressed in any of the sessions, important themes related to data collection and management were present throughout the meeting. Some of the key issues were:

- The need to establish definitions for data so that different data sources and be combined and used productively.
- The need for guidance on which data sources should be used appropriately for different kinds of analysis and what baselines should be.
- Significant issues related to the timeliness of data and the obstacles to reduce time between collection and analysis.
- The need for best practices in supplementing agency generated data with data purchased from vendors.

Beyond the workshop SCOPM has done considerable work on how performance measurement is affected by MAP-21, giving recommendations for the different performance areas.[14] Their focus is primarily on how to address performance measurement in the different system areas,

[11] http://www.fhwa.dot.gov/map21/factsheets/hsip.cfm

[12] http://www.fhwa.dot.gov/map21/guidance/guideeldnhsb.cfm

[13] http://sites.spypondpartners.com/targetsetting/workshop/

[14] http://scopm.transportation.org/Documents/SCOPM%20Task%20Force%20Findings%20on%20Performance%20Measure%20Target-Setting%20FINAL%20v2%20%283-25-2013%29.pdf

giving little to no attention on the need for data inventory or management to achieve the proposed targets.

A 2015 GAO report entitled *DOT Is Progressing toward a Performance-Based Approach, but States and Grantees Report Potential Implementation Challenges* analyses where DOT and states are in terms of implementing the new targets set forth in MAP-21[15]. The report outlines why target based funding is needed to add accountability to the current system, but it also outlines a number of obstacles that will potentially hinder implementation. One of the greatest obstacles is the rulemaking process and its aggressive timeline which already has missed deadlines set out in MAP-21. The legislation gave DOT 1 to 1 ½ years to complete the rulemaking process, but GAO found that 2 ½ to 4 years is the average time it takes federal agencies (including DOT) to develop and issue rules.[16] The process is delayed from the number of comments from stakeholders, but also because many of the proposed rules in the four NPRMs are interrelated and dependent on one another. Another major implementation hurdle is the lack of consensus across states and grantees on what data should be collected, what data should be used for specific performance measures, and what are the measures being used. DOT has encouraged states to collaborate and share data, working with groups like AASHTO and APTA to get more direct feedback, but some states worry that too much emphasis will be on existing datasets required by FHWA and not taking advantage of emerging data sources. Several states also have concerns about the levels of staffing and technical expertise that will be required in-house. There are also concerns across the administrators interviewed for the report that the DOT cost estimates were too low.[17]

State DOT Response

Most state DOTs are currently researching their local procedures and planning what changes are needed to be compliant with the MAP-21 rules. Until the rulemaking comment period for performance measurement is closed and the rules and regulations are established, states can't fully commit to the program. Many are also waiting for the guidance from NCHRP 08-92, which should be published in May, 2015.

Missouri: Missouri DOT (MoDOT)[18] prepared for MAP-21 performance measures and the data self assessment through outreach to the MPOs and RPCs, strengthening and building upon existing relationships. They used three steps:

[15] *DOT Is Progressing toward a Performance-Based Approach, but States and Grantees Report Potential Implementation Challenges*, U.S. Government Accountability Office, GAO-15-217, http://www.gao.gov/products/GAO-15-217

[16] *ibid*. p.18

[17] *ibid*. p. 28

[18] Phone call with Mara Campbell, former head of Customer Relations for MoDOT who led this effort.

1. MoDOT scheduled quarterly meetings and webinars with the MPOs, RPCs, and other relevant groups to build community around the topic and publicize MoDOT's efforts.
2. A website was set up with a blog and interactive chat room to encourage collaboration across groups.
3. Address data sharing and reuse with MPOs to reduce duplication of effort in data collection.

The MoDOT experience may not be entirely translatable to California because of their relationship with MPOs and RPCs. Due to the size and population of Missouri, the MPOs and other local agencies depend on MoDOT for funding. MPOs in California, especially the largest ones, have larger budgets and more financial autonomy.

Virginia: In preparation for the new performance measures from MAP-21, Virginia DOT (VDOT) worked with the Texas A&M Transportation Institute to pilot a project for the state. Much of their work built upon the SCOPM Task Force and the proposed rules from FHWA, as well as TTI's reliability and congestion metrics. VDOT learned that developing and using these new metrics requires "significant level of technical skill and software resources that may or may not be available to a state DOT."[19] Agencies will need to invest in the appropriate hardware and data systems, as well as having staff with expertise to manage the required systems. These programs may not be feasible for every state DOT, so consultants may be needed to perform the analysis.

Colorado: Colorado DOT (CDOT) published their risk-based asset management plan in December 2013. The plan makes it clear that data-driven decision making is key to the success of their asset management program. To that end, data is treated throughout the different programmatic areas of CDOT as an asset that needs to be maintained to fulfil agency operations. Data management is considered by CDOT as critical in their portfolio of program risks.[20]

Washington: Washington State DOT (WSDOT) developed a MAP-21 Performance Management website under their Accountability Department.[21] The site links to FHWA's resources on transportation performance management, making it easy for WSDOT staff and stakeholders to follow the federal rulemaking process. The WSDOT site also contains direct links to USDOT's proposed rules and the state's local technical information and documentation for each performance area. The agency also created technical folios for many of the performance areas that succinctly present the proposed measures and requirements and WSDOT's process to

[19] "Preparing for MAP-21 System Performance Measure and Target-Setting Reuirements: Lessons Learned in Virginia," Eisele, W.L., Schrank, D.L., Fontaine, M.D.,*TRB 94th Annual Meeting Compendium of Papers*, 2015, no. 15-2321, http://trid.trb.org/view.aspx?id=1337563

[20] http://coloradotransportationmatters.com/wp-content/uploads/2013/04/CDOT_RBAMP.pdf p. 7-4

[21] http://wsdot.wa.gov/accountability/MAP-21

support and address those requirements. These folios act like brochures to quickly communicate the complex relevant information to stakeholders.