Accelerating Infrastructure Innovations

FOCUS

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INSIDE

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U.S. Department of Transportation
Federal Highway Administration

The STAR Approach to Tracking ASR in Concrete

Identify and track transportation infrastructure affected by alkali-silica reaction (ASR) with the Federal Highway Administration's (FHWA) new *Alkali-Silica Reactivity Surveying and Tracking Guidelines* (Pub. No. FHWA-HIF-12-046).

Dubbed STAR (Surveying and Tracking of Alkali-Aggregate Reaction), the guidelines focus on recognizing and monitoring ASR-induced expansion and cracking in bridges, pavements, and tunnels, though some of the information may also be applicable to other assets such as wharfs, piers, high-mast lights, and signs.

"These STAR guidelines provide the framework by which ASR-induced damage can be tracked with existing tools already being used by most State highway agencies, including bridge, pavement, and tunnel management systems," said Gina Ahlstrom of FHWA.

The guidelines can be used in conjunction with the FHWA *Alkali-Silica Reactivity Field Identification Handbook* (Pub. No. FHWA-HIF-12-022) (see August 2012 *Focus*). Graphically illustrating the sequence of how ASR develops, the handbook's photos provide a visual reference for identifying symptoms. To download the handbook, visit www.fhwa.dot.gov/pavement/concrete/asr/field.cfm.

ASR occurs when silica in some aggregates and alkalis in concrete combine with water to form a gel-like substance. As the gel absorbs water and expands, it can cause the concrete to crack. Over time, the cracks enable other forms of distress to occur, such as freeze-thaw damage or corrosion. This can lead to premature deterioration and loss of service life for concrete pavements and structures.

Using STAR, agencies can collect, quantify, and rank typical signs of ASR distress, based primarily on visual inspection. When a highway bridge or pavement section exhibits high values of ASR-related distress, such as cracking or joint deterioration, highway agencies can use this information to make decisions about conducting advanced studies to confirm the ASR diagnosis.

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A suggested protocol is offered for integrating ASR surveying and tracking into bridge, pavement, and tunnel management programs. For example, to provide an accurate and specific tracking index, bridge management programs must include features characteristic of ASR, such as map cracking, aligned cracking, gel exudation on the concrete surface,

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The STAR Approach,
continued from page 1

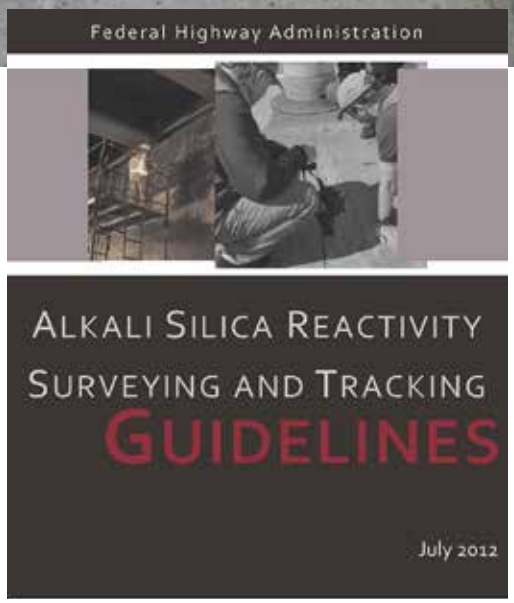
and relative dislocation or misalignment of adjacent sections. The guidelines include photographs illustrating different severity levels for the bridge defects, along with a discussion of each defect and definitions of condition states and associated criteria.

Characteristics of ASR in pavements that should be collected by pavement management systems are identified. These include map cracking, joint deficiencies and deterioration, and longitudinal cracking. As with bridges, detailed descriptions and criteria are included for each distress type, followed by photos of the defects with varying degrees of severity.

The discussion also covers tunnel inspection and management. Tunnels are constructed primarily of concrete, steel, and masonry, with some tunnel liner types commonly composed of concrete. The inverts of tunnels—the slab on which the roadway or track bed is supported—are also generally made from concrete and could potentially be affected by ASR. The guide looks at how to integrate identification of ASR into tunnel management programs. Defects to flag as potential indicators of ASR include map cracking, aligned cracking, exudation of gel on the concrete surface, and joint expansion or dislocation.

More information on managing ASR-affected structures is available in FHWA's 2010 *Report on the Diagnosis, Prognosis, and Mitigation of Alkali-Silica Reaction in Transportation Structures* (Pub. No. FHWA-HIF-09-004). The report is available at www.fhwa.dot.gov/pavement/concrete/pubs/hif09004/asr00.cfm. Additional resources for both structures and pavements can be found at FHWA's online ASR Reference Center at www.fhwa.dot.gov/pavement/concrete/asr.cfm. The center contains more than 300 specifications, guidance documents, test methods, and other references on ASR.

The edge beam supporting this bridge railing has minor ASR-related cracking.



To download the *Alkali-Silica Reactivity Surveying and Tracking Guidelines*, visit www.fhwa.dot.gov/pavement/pub_details.cfm?id=820. For more information on the guidelines, contact Gina Ahlstrom at FHWA, 202-366-4612 (email: gina.ahlstrom@dot.gov). ✻

Assessing Pavement Structural Performance for PMS Applications

LTPP Program Develops Step-by-Step Guide

Step-by-step instructions for interpreting and evaluating pavement deflection data for network-level pavement management system (PMS) applications are available in a new guide released by the Federal Highway Administration's (FHWA) Long-Term Pavement Performance (LTPP) program.

Simplified Techniques for Evaluation and Interpretation of Pavement Deflections for Network-Level Analysis: Guide for Assessment of Pavement Structural Performance for PMS Applications (Pub. No. FHWA-HRT-12-025) spotlights how to assess a pavement's structural characteristics using falling weight deflectometers (FWDs) or heavy weight deflectometers (HWDs), combined with other readily available pavement performance data.

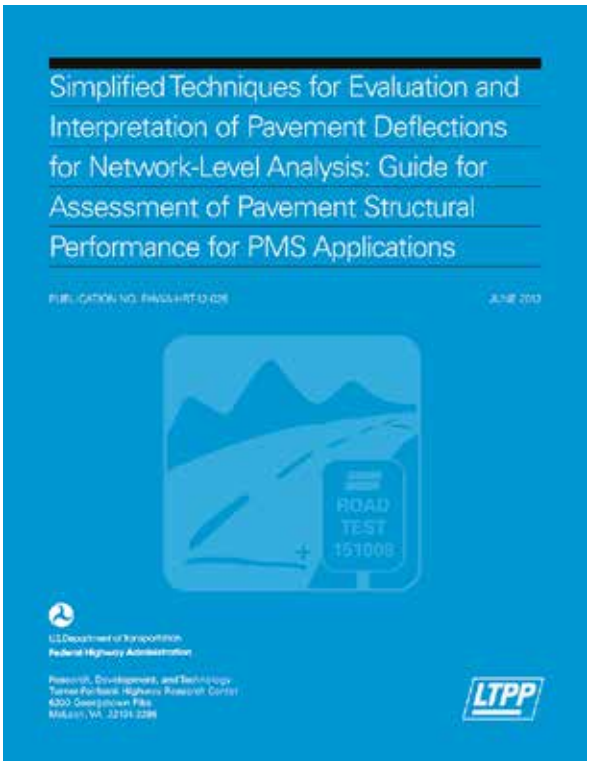
While there are many viable techniques available for evaluating the structural capacity of pavements that use FWDs for project-level analysis, many of these techniques are time consuming and require an experienced analyst. As a result, using pavement deflection testing for network-level analysis has been limited. The new guide presents a simpler approach.

The guide examines required input data, including pavement age, average daily volume of 18-wheel truck traffic, average annual daily truck traffic, average annual precipitation in the geographical area, the base type for asphalt pavements, and subgrade type for concrete pavements. Data on rutting and surface cracking should be included for asphalt pavements, while joint faulting and transverse slab cracking should be examined for jointed concrete pavements. Roughness data should be included for both types of pavements. Also featured in the guide are recommended sensor positions for network-level FWD or HWD testing.

Selecting appropriate analysis techniques is covered. The appropriate technique depends on the pavement type and the type of distress an agency wants to use to characterize structural condition. At a minimum, the guide recommends that the typical distresses observed on the local road network be used. As system-wide load deflection data is not available for most agencies, it is recommended that global models and threshold values be used until local calibration of the FWD or HWD can take place.

Local calibration will significantly improve the accuracy of the models. Guidelines are provided for local calibration, taking agencies through the necessary steps. The guidelines encompass data preparation, logistic model calibration, verification of accuracy, and analysis of the sensitivity of the logistic models to a given set of site characteristic variables. These variables could range from high truck volume to a cold climate. Two examples of sensitivity analysis are provided.

Analysis techniques highlighted for asphalt pavements include the structurally based roughness performance model and fatigue cracking performance model. For concrete pavements, featured analysis techniques are structurally based roughness performance models, joint faulting models, and the transverse slab cracking performance model. Also examined are optimum spacing and timing for FWD measurements. Deflection testing should be avoided when pavements are frozen and during the spring thaw. Asphalt pavements should be tested on a 5-year cycle, while concrete pavements can be tested every 10 years.



To download a copy of the guide, visit www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpp/12025/index.cfm. For more information, contact Larry Wiser at FHWA, 202-493-3079 (email: larry.wiser@dot.gov). *

2012 Industrial Materials Conference: The State of the Practice for Sustainable Pavements

Highway engineers and materials suppliers from across the country will discuss best practices in the use of recycled materials in sustainable pavement systems at the 2012 Industrial Materials Conference, scheduled for November 28–29, 2012, in Indianapolis, Indiana.

The conference is cohosted by the Federal Highway Administration (FHWA), Indiana Department of Transportation, and Industrial Resources Council (IRC). Program support is also being provided by the Recycled Materials Resource Center at the University of Wisconsin-Madison (RMRC-3G) and Transportation Research Board.

"Transportation agencies and other project owners are increasingly focused on how to build and maintain pavement systems that are both environmentally and economically sustainable," said Lee Gallivan, FHWA Recycling Program Manager. "Sustainable material choices can have a significant impact on long-term pavement performance as well as project costs, since materials typically consume up to 60 percent of a project budget."

The FHWA Recycling Policy, adopted in 2002, encourages the reuse of materials to support transportation needs of State and local agencies. The policy states:

1. Recycling and reuse can offer engineering, economic, and environmental benefits.
2. Recycled materials should get first consideration in materials selection.
3. Determination of the use of recycled materials should include an initial review of engineering and environmental suitability.
4. An assessment of economic benefits should follow in the selection process.
5. Restrictions that prohibit the use of recycled materials without technical basis should be removed from specifications.

Advances in recycling and reclaiming technology over the past decade have increased the types of recycled or reclaimed materials in use and the range of their applications. When appropriately used, these materials can reduce costs, save time, offer equal or in some cases improved performance, and provide long-term sustainable benefits. The increased use of recycled concrete aggregate (RCA), for example, reduces the need for virgin aggregate, which is a scarce commodity in some areas of the United States. RCA use can increase project efficiencies and lower job costs, as well as decreasing the amount and cost of construction debris targeted for landfills.

The conference will help State and local agencies expand their use of reusable materials by highlighting state-of-the-art technologies and programs. Conference technical sessions will cover the use of recycled materials for subbases, soil stabilization, and embankments; base courses; and pavement surfaces. Among the presentations offered are Recycled Concrete Aggregate in Base Courses, Use of Pulp and Paper Byproducts in Soil Stabilization, Foundry Sand Use in Geotechnical Projects, Steel Furnace Slag in Hot-Mix Asphalt, and Scrap Tire Use in Quiet Pavements.

"The goal of this conference is to showcase case studies and best practices that highway engineers and contractors can adopt in support of their overall sustainability goals," said Michael Blumenthal, President of the IRC and Vice President of the Rubber Manufacturers Association.

Recycled shingles can be used in hot-mix asphalt.

Attendees can participate in a roundtable session examining "What is needed in terms of information, resources, and training in order to increase the use of industrial materials in the highway environment?" Another roundtable will ask participants, "What are three things that your organization could do to increase your use of sustainable industrial materials in the next 3 to 5 years?"

The conference will highlight tools and resources available to assist States as they increase their use of sustainable industrial materials. These resources include the American Association of State Highway and Transportation Officials Center for Environmental Excellence (environment.transportation.org), RMRC-3G (www.rmrc.wisc.edu), IRC Web site (www.industrialresourcescouncil.org), and FHWA Recycling Web page (www.fhwa.dot.gov/pavement/recycling).

FHWA resources also include a new National Highway Institute course on Asphalt Pavement In-Place Recycling Techniques (Course No. FHWA-NHI-131050). Developed by FHWA in partnership with the Asphalt Recycling and Reclaiming Association, the course examines three principal recycling techniques: hot in-place, cold in-place, and full depth reclamation. Participants will learn about selecting a technique, materials consideration and mix design, construction specifications, and project control considerations for each technology. The course combines Web-based training modules with 2 days of classroom instruction. For more information, visit www.nhi.fhwa.dot.gov.

To learn more about the 2012 Industrial Materials Conference and to register, visit www.industrialresourcescouncil.org. Information is also available by contacting Lee Gallivan at FHWA, 317-226-7493 (email: victor.gallivan@dot.gov). For information on FHWA's Recycling Policy, visit www.fhwa.dot.gov/legsregs/directives/policy/recmatpolicy.htm. *

© Rubber Manufacturers Association

Tire-derived aggregate made from recycled tires is applied to a roadway.

© Construction Materials Recycling Association

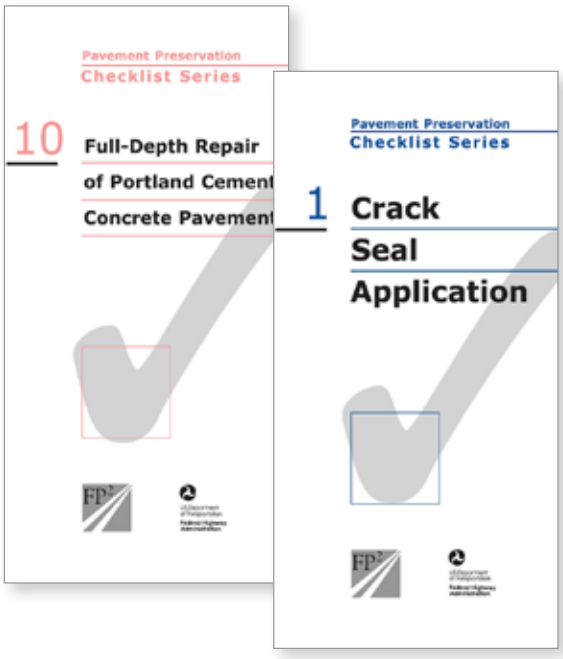
Concrete is processed for reuse as roadway materials.

New App Brings Pavement Preservation Checklists Straight to Your Smart Phone

Pavement preservation just became more efficient, thanks to a free mobile application released by the Federal Highway Administration (FHWA). FHWA's Pavement Preservation Checklists are now available on smart phones that use the Android™ operating system and BlackBerry® phones. They will soon be available on iPhones®.

The 14 checklists were created to help guide State and local highway maintenance and inspection staff in the proper use of pavement preservation processes. Users can find checklists on topics ranging from using thin hot-mix asphalt overlays to performing full-depth repair of concrete pavements to applying crack seals to pavements. The new application provides highway agencies and contractors with all of the checklists in an easy-to-use mobile format, ensuring that highway workers have the information they need on the job site.

To obtain the free app, visit the Android Market or BlackBerry App World on a smart phone and enter "FHWA" into the search field. For additional information on the Pavement Preservation Checklists, visit www.fhwa.dot.gov/pavement/pub_details.cfm?id=350. To learn more about pavement preservation, visit www.fhwa.dot.gov/preservation. *



Infrastructure Innovation Webinars

These free Webinars provide a quick introduction to the latest infrastructure innovations and technologies.

GIS Tools for Linking Transportation and Natural Resource Planning

October 18, 2012, 2:30–4 p.m. (eastern daylight time)

Learn how to use geographic information system (GIS) tools to better balance the needs of transportation projects with environmental concerns at this Webinar sponsored by the Federal Highway Administration (FHWA) and American Association of State Highway and Transportation Officials Technology Implementation Group. The Webinar will focus on multiple benefits resulting from Maryland's use of GIS tools for a transportation improvement project on U.S. 301 in Waldorf, including improved quality, accelerated project planning and completion, and increased ecological benefits.

For registration information, visit www.nhi.fhwa.dot.gov/resources/webconference/web_conf_learner_reg.aspx?webconfid=24772. For additional information on the Webinar, contact Byron Lord at FHWA, 202-366-1325 (email: byron.lord@dot.gov).

FHWA Load and Resistance Factor Rating (LRFR) Implementation Webinar Series

Application of Load Testing in Bridge Load Rating

December 6, 2012, 1–4 p.m. (eastern standard time)

The Webinar will provide participants with the latest information on using the load testing technique to evaluate live load carrying capacity of bridges. Among the highlights will be resources available and lessons learned. The session will focus on experiences in North Carolina and Rhode Island, as well as load testing of bridges at Logan Airport in Boston, Massachusetts.

The target audience for the Webinar is bridge and structures staff from local, regional, and State transportation agencies; FHWA staff; and consultants. Participants will have the opportunity to download Webinar presentations.

Registration for the Webinar is available at https://connectdot.connectsolutions.com/loadtest02/event/registration.html. For more information, contact Lubin Gao at FHWA, 202-366-4604 (email: lubin.gao@dot.gov). *

Highway Technology Calendar

The following events provide opportunities to learn more about products and technologies for accelerating infrastructure innovations.

Highways for LIFE Accelerated Bridge Construction Showcase
October 27–28, 2012, Linthicum, MD

The Maryland State Highway Administration will use accelerated bridge construction technologies to replace two bridge superstructures on West Nursery Road over the Baltimore-Washington Parkway. On separate weekends, each existing structure will be removed and a new one installed in less than 34 hours. This free Highways for LIFE showcase will allow participants to witness one of the bridge installations and learn about the project's successes, challenges, and lessons learned.

Contact: To register for the showcase, visit www.t2events.ce.ufl.edu/assnfe/ev.asp?ID=1903. For more information, contact Mary Huie at the Federal Highway Administration (FHWA), 202-366-3039 (email: mary.huie@dot.gov), or visit www.fhwa.dot.gov/hfl/showcases/md.

2012 Industrial Materials Conference
November 28–29, 2012, Indianapolis, IN

The conference will feature best practices in the use of high-volume recycled materials in sustainable pavement systems. Conference sponsors include FHWA, the Industrial Resources Council, and the Indiana Department of Transportation. For more information, see article on page 4.

Contact: Lee Gallivan at FHWA, 317-226-7493 (email: victor.gallivan@dot.gov), or visit www.industrialresourcescouncil.org.

Transportation Research Board (TRB) 92nd Annual Meeting
January 13–17, 2013, Washington, DC

More than 11,000 transportation professionals from around the world will gather to share perspectives on developments in transportation research, policy, and practice. The theme for 2013 is "Deploying Transportation Research—Doing Things Smarter, Better, Faster."

Contact: For information, visit the TRB Web site at www.trb.org (click on "Annual Meeting"). Questions about the meeting can be emailed to trbmeetings@nas.edu.

2013 Design-Build in Transportation Conference
March 18–20, 2013, Orlando, FL

Join transportation leaders in discussing lessons learned in the use of the design-build project delivery method for transportation projects. Discussions will cover choosing the right delivery method, contracting approaches, innovative financing solutions, risk allocation, and performance contracting.

Contact: Jerry Yakowenko at FHWA, 202-366-1562 (email: gerald.yakowenko@dot.gov), or visit www.dbtranspo.com.

Seventh National Seismic Conference on Bridges and Highways
May 20–22, 2013, Oakland, CA

Conference sessions will focus on understanding and mitigating damage to the Nation's highway infrastructure from earthquakes and other natural hazards. Sponsors include FHWA; the California Department of Transportation; TRB; American Association of State Highway and Transportation Officials; University at Buffalo, The State University of New York; and the Multidisciplinary Center for Earthquake Engineering Research.

Contact: Phillip Yen at FHWA, 202-366-5604 (email: wen-huei.yen@dot.gov), or visit http://7nsc.info.

Second National Covered Bridge Conference
June 5–8, 2013, Dayton, OH

The FHWA National Historic Covered Bridge Preservation Program is sponsoring the conference in partnership with the National Park Service and U.S. Forest Service. Themes include research and rehabilitation projects, best practices for rehabilitation, and continuing threats and challenges to covered bridges, including damage caused by Hurricane Irene and Tropical Storm Lee in 2011. Participants will have the opportunity to tour several historic covered bridges.

Contact: Everett Matias at FHWA, 202-366-6712 (email: everett.matias@dot.gov), or visit www.woodcenter.org/2013-national-covered-bridge-conference. *

FOCUS

Focus (ISSN 1060-6637), which is published monthly by the U.S. Department of Transportation's Federal Highway Administration (FHWA), covers the implementation of innovative technologies in all areas of infrastructure.

Its primary mission is twofold: (1) to serve the providers of highway infrastructure with innovations and support to improve the quality, safety, and service of our roads and bridges; and (2) to help promote and market programs and projects of the various offices of FHWA's Office of Infrastructure.

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MAP-21: Moving Ahead for Progress in the 21st Century

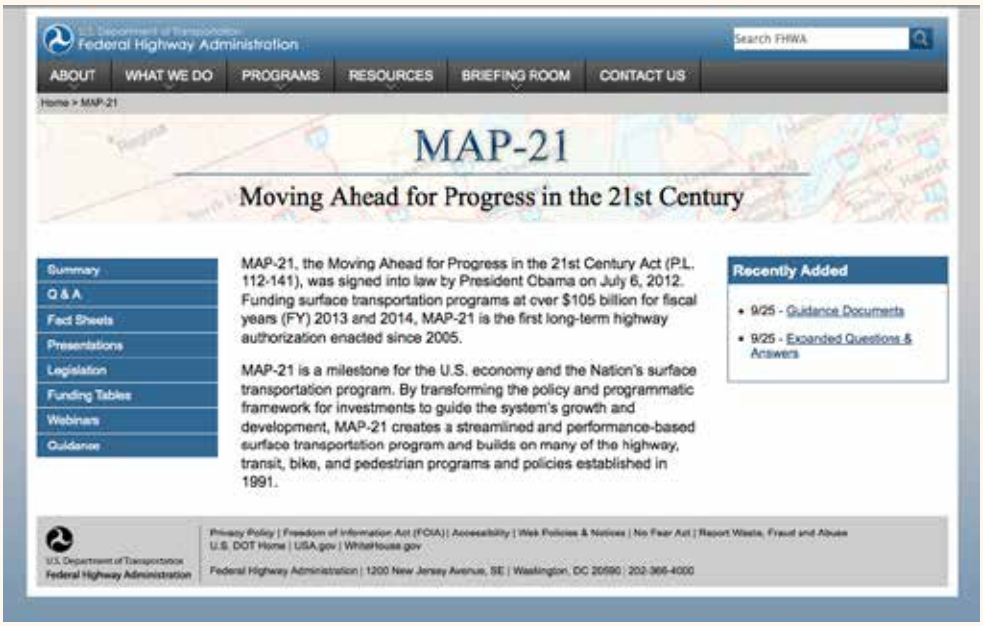
MAP-21, the Moving Ahead for Progress in the 21st Century Act, funds surface transportation programs at more than $105 billion for fiscal years 2013 and 2014. Signed into law on July 6, 2012, MAP-21 is the first multiyear highway authorization law enacted since 2005.

The Act creates a streamlined, performance-based, and multimodal program to address the challenges facing the U.S. transportation system, including improving safety, maintaining infrastructure condition, reducing traffic congestion, improving the efficiency of the system and freight movement, protecting the environment, and reducing delays in project delivery.

MAP-21 transforms Federal highway programs, dramatically reducing the number of programs and targeting resources to an expanded National Highway System, focusing on national transportation goals, and increasing accountability. Through performance-based planning and programming, MAP-21 provides a means to more efficiently invest transportation resources.

MAP-21 funding of $82 billion for highway programs, including road, bridge, bicycling, and pedestrian improvements, and a dramatic increase in funding for infrastructure safety, will create jobs and support economic growth.

To learn more about MAP-21, visit www.fhwa.dot.gov/map21. ✻



Visit www.fhwa.dot.gov/map21 to learn more about MAP-21.