

# Every Day Counts: An Innovation Partnership with States

## *EDC-3 Progress Report #3*

January – June 2016



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“An innovative culture is difficult to quantify, but it starts with innovation champions and making sure the message reaches every person in the department that they are empowered to innovate. It's a top-down, bottom-up mentality.”

— Jennifer Cohan, Delaware Department of Transportation Secretary

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# Foreword



Every Day Counts is the Federal Highway Administration's initiative to advance a culture of innovation in the transportation community in partnership with public and private stakeholders. Through this state-based effort, FHWA coordinates rapid deployment of proven strategies and technologies to shorten the project delivery process, enhance roadway safety, reduce congestion and improve environmental outcomes.

This report summarizes the June 2016 status of innovation deployment for the 11 innovations in the third round of EDC, which focuses on creating efficiency through technology and collaboration. The report is intended as a resource for transportation stakeholders implementing innovation deployment plans and to encourage ongoing innovation in highway project delivery to better serve the nation.

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"We have a huge system and not a lot of money, so the idea of driving innovation to get better results for the people we serve is important. We put it in our mission and our value statements and we talk about being bold and willing to take risks."

— Ed Hassinger, Missouri Department of Transportation Chief Engineer

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## ACRONYMS AND ABBREVIATIONS

3D .....	three-dimensional
4D .....	four-dimensional
5D .....	five-dimensional
AASHTO .....	American Association of State Highway and Transportation Officials
AID Demonstration .....	Accelerated Innovation Deployment Demonstration
DOT .....	department of transportation
EDC .....	Every Day Counts
FAST Act .....	Fixing America's Surface Transportation Act
FHWA .....	Federal Highway Administration
GRS-IBS .....	geosynthetic reinforced soil-integrated bridge system
IQED .....	implementing quality environmental documentation
ITS .....	intelligent transportation system
NEPA .....	National Environmental Policy Act
SHRP 2 .....	second Strategic Highway Research Program
STIC .....	State Transportation Innovation Council
UHPC .....	ultra-high performance concrete

# Every Day Counts

**Every Day Counts** is the Federal Highway Administration's initiative to work in partnership with the **American Association of State Highway and Transportation Officials** and other transportation stakeholders to foster a culture of innovation. It focuses on accelerating project delivery and getting proven innovations quickly and broadly deployed to benefit road users. Designed to complement other initiatives centering on innovative technologies, practices and investment, EDC plays an important role in helping transportation agencies fulfill their obligation to the American people to deliver the greatest value for the tax dollars spent.



Every two years, FHWA works with state departments of transportation, local governments, tribes, private industry and other stakeholders to identify a new set of innovative technologies and practices that merit widespread deployment through EDC. The selected innovations share common goals of shortening project delivery, enhancing the safety and durability of roads and bridges, cutting traffic congestion and improving environmental sustainability. The **third round of EDC**, which promotes the adoption of 11 innovations in 2015 and 2016, builds on the success of deployment efforts during EDC-1 in 2011 and 2012 and EDC-2 in 2013 and 2014.

After the process of selecting EDC innovations for each two-year deployment cycle is completed, transportation leaders from across the country gather at regional summits to discuss the innovations and commit to finding opportunities to implement those that best fit the needs of their state highway programs. Information gathered at the summits is brought back to **State Transportation Innovation Councils**, which bring together public and private stakeholders to evaluate innovations and spearhead their deployment. STICs are active in all 50 states, Washington, D.C., Puerto Rico, the U.S. Virgin Islands and Federal Lands Highway.

EDC's collaborative, state-based approach to deploying innovation enables states to be in the driver's seat and decide which innovations will work best for them and their customers. Working through STICs, states can consider innovations FHWA recommends, along with technologies and practices from sources such as the AASHTO **Innovation Initiative** and the **second Strategic Highway Research Program**, and adopt those that add value to their highway programs. "EDC and other technology initiatives have really been critical in helping states save money and save time," said Bud Wright, AASHTO executive director.



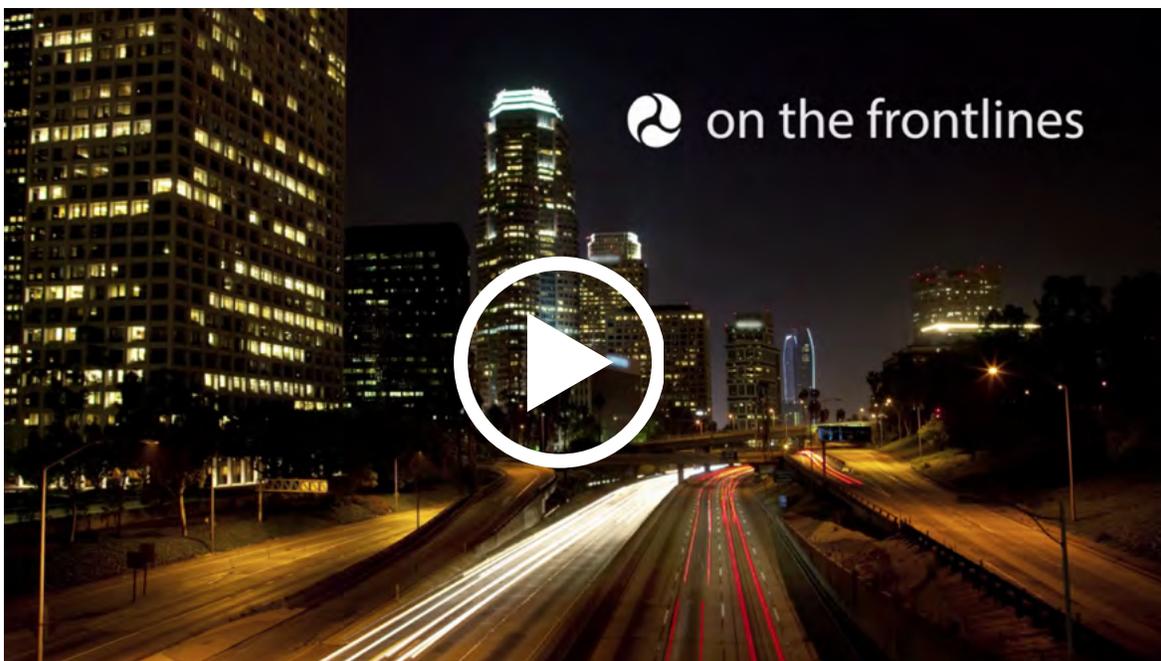
"We've said from the inception of Every Day Counts that it was going to be a state-based initiative. The leadership of the states has been instrumental in the success we've achieved together."

– Gregory Nadeau  
FHWA Administrator

FHWA's role in the EDC process is to provide national leadership in encouraging adoption of innovations that can improve the nation's transportation system. The agency forms a deployment team for each EDC innovation to assist states in their implementation efforts. Using feedback from stakeholders obtained through communication opportunities such as the EDC summits, the teams offer technical assistance, training and outreach to help the transportation community adopt innovations and make them standard practice. FHWA also offers assistance through its **State Transportation Innovation Council Incentive** and **Accelerated Innovation Deployment Demonstration** programs to encourage and provide incentives for innovation deployment.

The EDC initiative has had a significant positive impact on the highway community's adoption of new technologies and processes. Every state has used 10 or more of the 32 innovations promoted under the initiative, and some have adopted more than 20. Several of those innovations are now mainstream practices in many states. The initiative has also fostered a transportation workforce that is adept at putting innovation to work to address transportation challenges. The 2015 **Fixing America's Surface Transportation Act** included EDC by name, directing FHWA to continue cooperating with stakeholders to deploy new practices and technologies and create a culture of innovation in the highway community.

"We're saving money, saving time and saving lives, exactly the results we said were possible if we made innovation a standard industry practice," said FHWA Administrator Gregory Nadeau. "And we're making a strong case to Congress and policy makers in the states for future investments in transportation."



**View video** on how FHWA works with transportation partners to deploy innovations that save time, money and lives.

# EDC-3 Innovation Implementation

Every six months, FHWA compiles a status report on the state of practice for the current round of EDC innovations. This section provides details on the 11 innovations in EDC-3 and includes maps and charts that show the progress made in advancing the technologies and practices by the end of June 2016.

The maps illustrate the innovation implementation stage in each state in June 2016. The charts show the number of states in each implementation stage in June 2016. The charts also compare the June 2016 state of practice to the January 2015 baseline data and December 2016 goals set by states.

As states implement their innovation deployment plans, the number of states in the advanced (darker blue) stages will increase while the number of states in the initial (lighter blue) stages will decrease with each six-month progress report.

“State” is used as a general term that includes the state transportation department, metropolitan planning organizations, local governments, tribes, private industry and other stakeholders in a state or territory. Information is provided for the 50 states, Washington, D.C., Puerto Rico, the U.S. Virgin Islands and Federal Lands Highway, a total of 54 entities.

The following table defines the innovation deployment stages displayed on the maps and charts.

## Innovation Implementation Stages

<b>Not Implementing</b>	The state is not pursuing the innovation.
<b>Development Stage</b>	The state is collecting guidance and best practices, building support with partners and stakeholders, and developing an implementation process.
<b>Demonstration Stage</b>	The state is testing and piloting the innovation.
<b>Assessment Stage</b>	The state is assessing the performance of and process for carrying out the innovation and making adjustments to prepare for full deployment.
<b>Institutionalized</b>	The state has adopted the innovation as a standard process or practice and uses it regularly on projects.

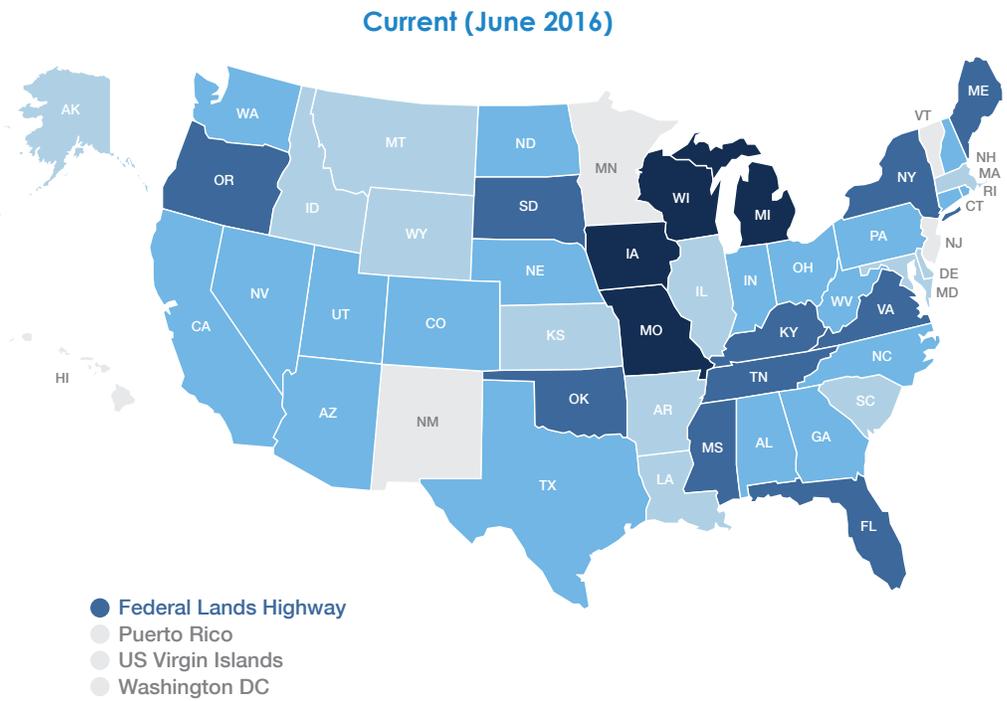
# 3D Engineered Models: Schedule, Cost and Post-Construction

**Three-dimensional engineered models** are widely used by the highway community to more effectively connect a project's design and construction phases. These models can also be applied to other phases of the project delivery cycle to positively affect safety, costs, contracting, maintenance and asset management.

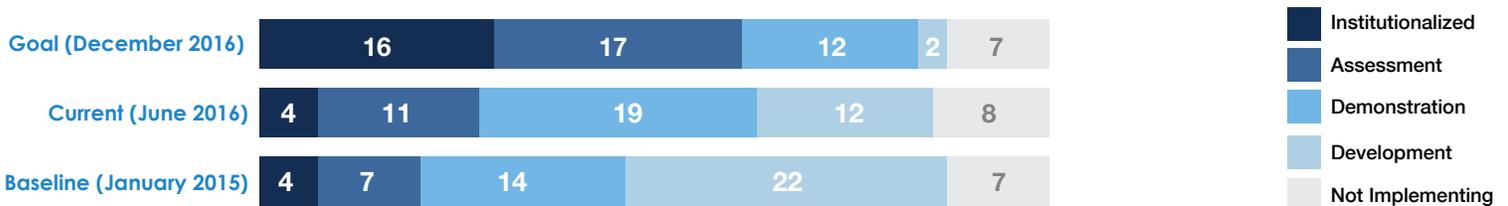
After encouraging adoption of 3D models in EDC-2, FHWA is continuing to promote the technology in EDC-3 with a focus on three practices: using survey data for roadway inventory and asset management purposes, incorporating schedule (4D) and cost (5D) information into models to streamline construction schedules and improve cost estimating, and using post-construction survey data to correct design models and create accurate as-built record drawings.

## Project Planning, Design and Construction

Using 3D engineered models in project planning, design and construction is becoming a widespread practice, with 29 states and Federal Lands Highway implementing it or planning how to make it a standard practice. Four states have institutionalized the practice.

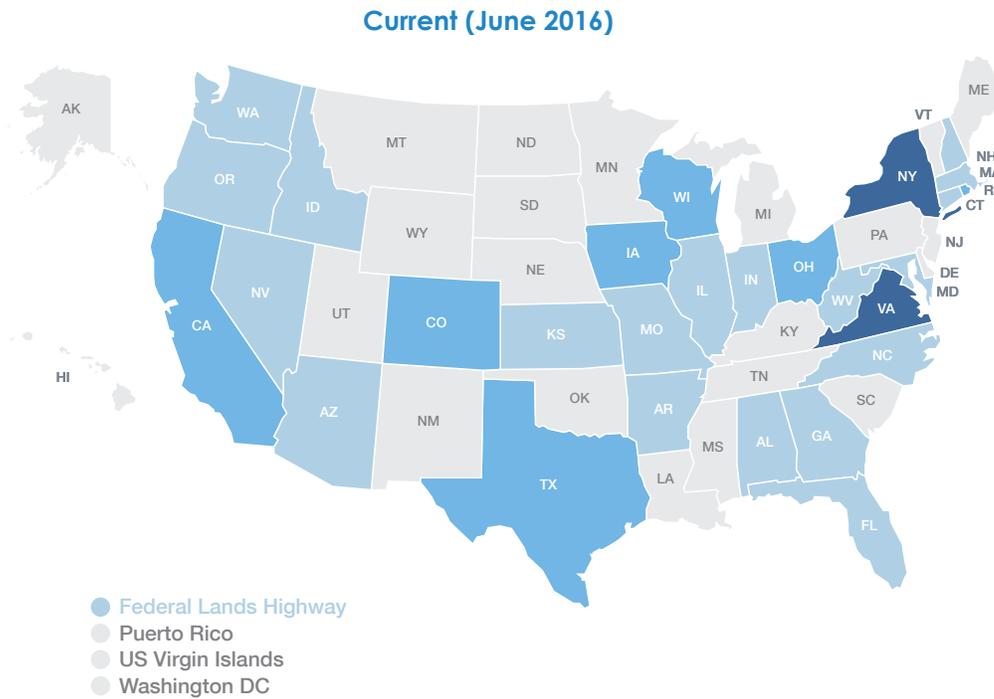


**Number of States in Various Implementation Stages**

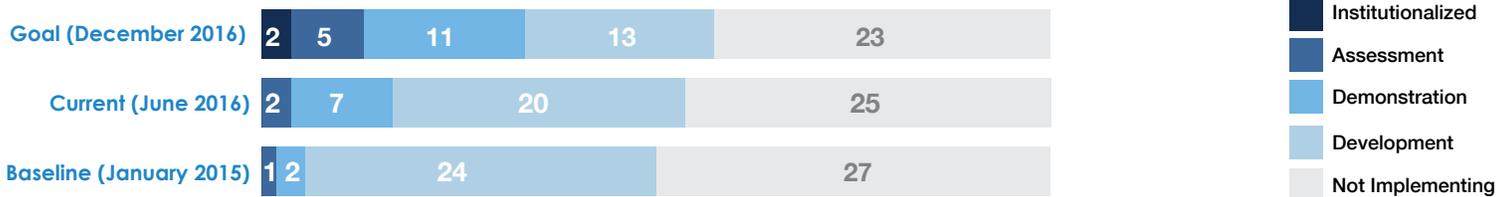


# Schedule and Cost

Nine states are exploring the use of 4D and 5D modeling by incorporating schedule and cost data into 3D design models to improve project management and provide more accurate cost estimates.

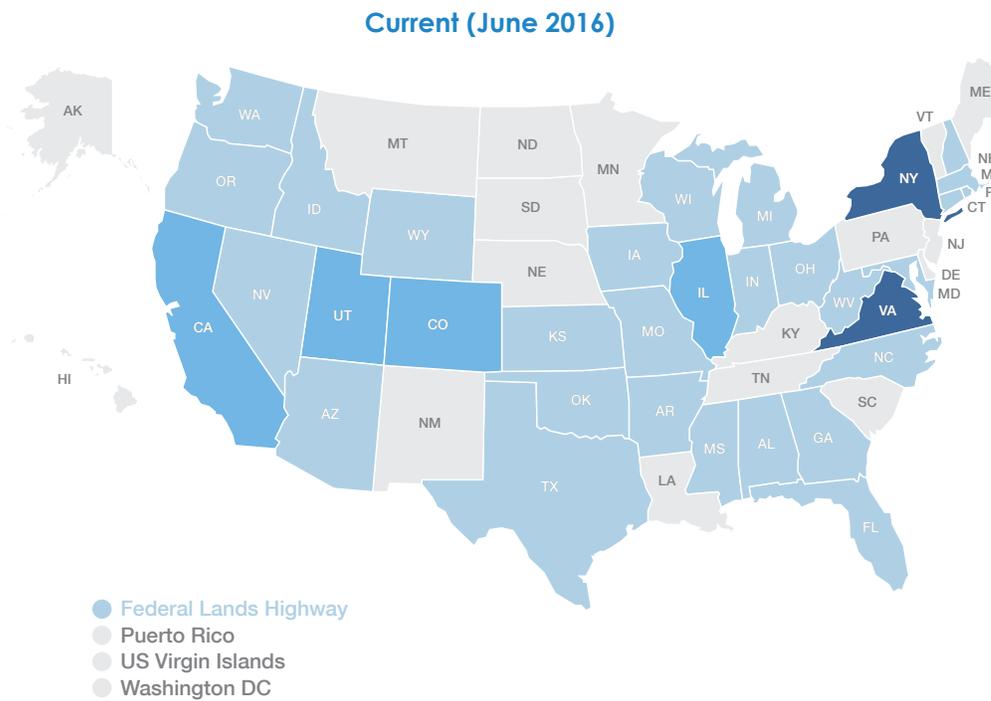


## Number of States in Various Implementation Stages

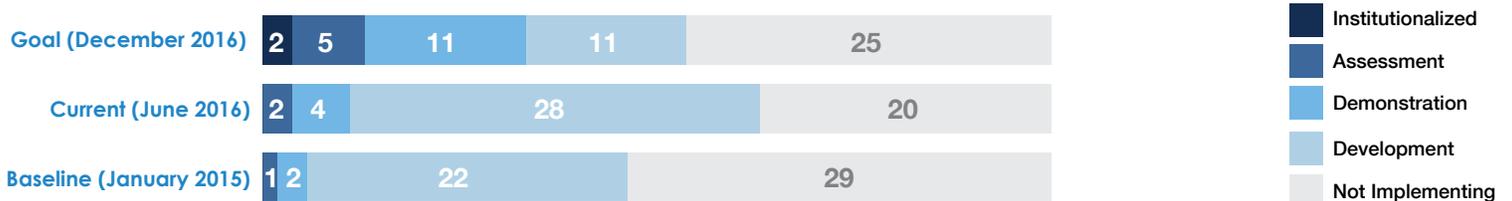


# Post-Construction

Six states are applying 3D engineered models in post-construction applications, such as using 3D data for roadway inventory and asset management purposes and creating accurate as-built records of 3D design models.



**Number of States in Various Implementation Stages**



# Highlights: 3D Engineered Models

## Alabama

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The **Alabama** DOT is conducting a 3D engineered model pilot project. For the first time, it is using a 3D model developed by agency staff on a project and providing the 3D model to contractors bidding on the project. Contractors' use of the 3D model is expected to reduce project costs and delivery time.

## California

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The **California** DOT updated its directive on sharing electronic files to include 3D engineered models. Once the directive is approved, 3D engineered models will be shared with bidders for all projects with earthwork. The agency is finalizing a specification for automated machine guidance to complement the directive. The agency is using a SHRP2 grant on a project to build a database for capturing and using 3D subsurface utility data.

## Connecticut

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The **Connecticut** DOT hosted an FHWA workshop and peer exchange that enabled about 100 contractors, consultants and DOT staff to learn about and share information on using 3D engineered models. The Connecticut DOT plans to make electronic engineering data—along with project plans, specifications and estimates—available to contractors who bid on future roadway, traffic and bridge projects. The agency developed a phased plan to move forward on delivery of 3D models along with contract plans. The Connecticut DOT is also developing post-construction 3D modeling for asset management and maintenance purposes.

## Federal Lands Highway

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As part of its effort to transition to a new 3D design tool, **Federal Lands Highway** is planning user training sessions and updating its design manual. Federal Lands Highway is also producing case studies and developing training for construction staff on automated machine guidance.

## Georgia

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The **Georgia** DOT is incorporating 3D modeling in its design procedures and plans to provide 3D information to contractors at the prebid stage in the future. The agency provided a set of test data to contractors in the LandXML file format, a data exchange format for civil engineering and survey data. Contractors were able to use the data successfully, and the Georgia DOT plans additional tests.

## Illinois

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As part of its effort to advance 3D engineered modeling, the **Illinois** DOT is using STIC Incentive program funds to develop libraries of 3D civil cells, commonly used geometric design layouts that can be applied in a variety of situations. The agency is also using STIC funds to conduct training on 3D modeling.

## Iowa

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The **Iowa** DOT plans to conduct four to eight pilot projects using 3D modeling as part of its effort to implement civil integrated management, technology-enabled collection and use of data and information throughout the life cycle of a transportation asset. The agency is developing a 3D model for two bridges on the I-80/I-380 interchange improvement project in Johnson County. Using 3D modeling on the project will help the agency refine its implementation strategy for 3D bridge design.

## Louisiana

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The **Louisiana** Department of Transportation and Development received STIC Incentive program funds to set up and configure 3D design software to the agency's standards. The Louisiana Transportation Conference in February 2016 included a well-attended session on using 3D modeling with speakers from the Iowa and Missouri DOTs and private industry sharing best practices and lessons learned.

# Highlights: 3D Engineered Models

## Michigan

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As part of its effort to enhance digital project delivery, the **Michigan** DOT hosted an FHWA workshop on 3D engineered models that included a focus on implementation planning. The Michigan DOT began a post-construction data collection process on several projects using mobile light detection and ranging, or LiDAR, technology. Project objectives include developing construction as-built requirements and recommendations for mobile LiDAR collection.

## Mississippi

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The **Mississippi** DOT uses 3D engineered models for all right-of-way plans. One benefit of the practice the agency has noted is the ability to identify and resolve conflicts on project plans before projects reach the construction phase. The agency plans to share lessons learned and benefits observed after it completes a data assessment on its use of 3D technology.

## Nebraska

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The **Nebraska** Department of Roads has 54 projects under development using 3D modeling software. On 10 projects that are ready for construction, the agency made 3D models available to contractors. The projects will enable the agency to gain experience using 3D modeling technology and refine the process to fit its construction needs. To help with 3D implementation, the agency formed a 3D modeling users group that includes agency representatives, contractors and design consultants.

## New York

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The **New York** State DOT received AID Demonstration funds to use 3D engineered models on the Kew Gardens interchange reconstruction project in Queens. The 3D models will incorporate civil integrated management supported with sensor and smart technologies. A civil integrated management workshop enabled agency staff to gain a greater understanding of 3D modeling and related digital applications.

## South Carolina

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The **South Carolina** DOT is using an automated machine guidance specification on five road widening projects. The agency reports that the specification reduces conflicts that can arise on projects when the agency and contractor use different methods of surveying and verification. Automated machine guidance also saves time on staking on projects and allows early identification of design errors.

## Washington

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The **Washington** State DOT piloted the inclusion of a contract requirement for contractor-generated 3D modeling on a large design-bid-build contract. The primary purpose was clash detection in critical areas of the bridge superstructure. The agency is reviewing the effectiveness and clarity of the specification.

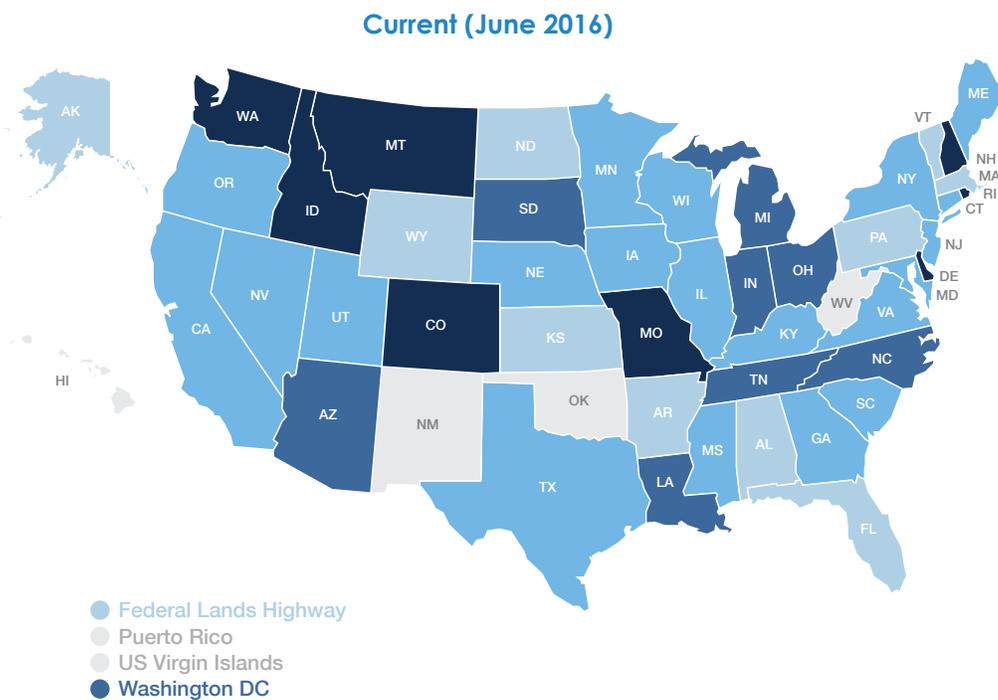
# Data-Driven Safety Analysis

**Data-driven safety analysis** promotes the integration of safety performance into highway investment decisions with the goal of saving lives. Advances in highway safety analysis can provide transportation agencies with the reliable data they need to make effective investments in safety improvements.

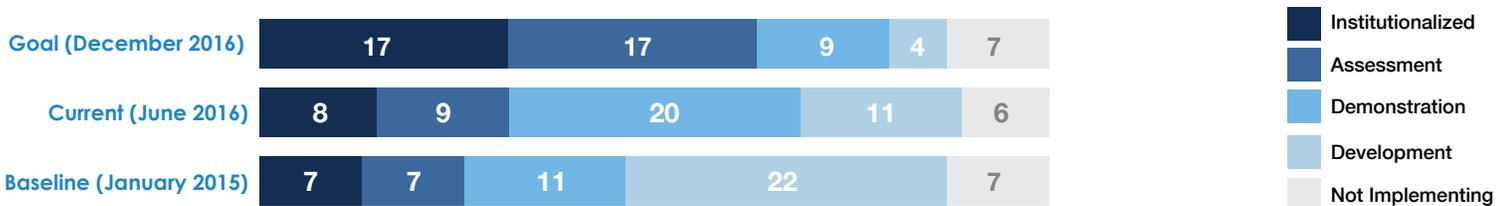
EDC-3 focuses on broadening the use of two approaches to better target highway safety investments and reduce crashes and fatalities. Predictive approaches combine crash, roadway inventory and traffic volume data to provide more reliable estimates of an existing or proposed road's expected safety performance. Systemic approaches screen a road network for high-risk features associated with severe crashes and identify low-cost safety treatments.

## Project Development

The benefits of data-driven safety analysis in project development have attracted interest across the country. Twenty-eight states and Washington, D.C., are applying data-driven safety analysis in project development. Eight states have incorporated predictive safety analysis as a standard practice in their project development processes and policies.

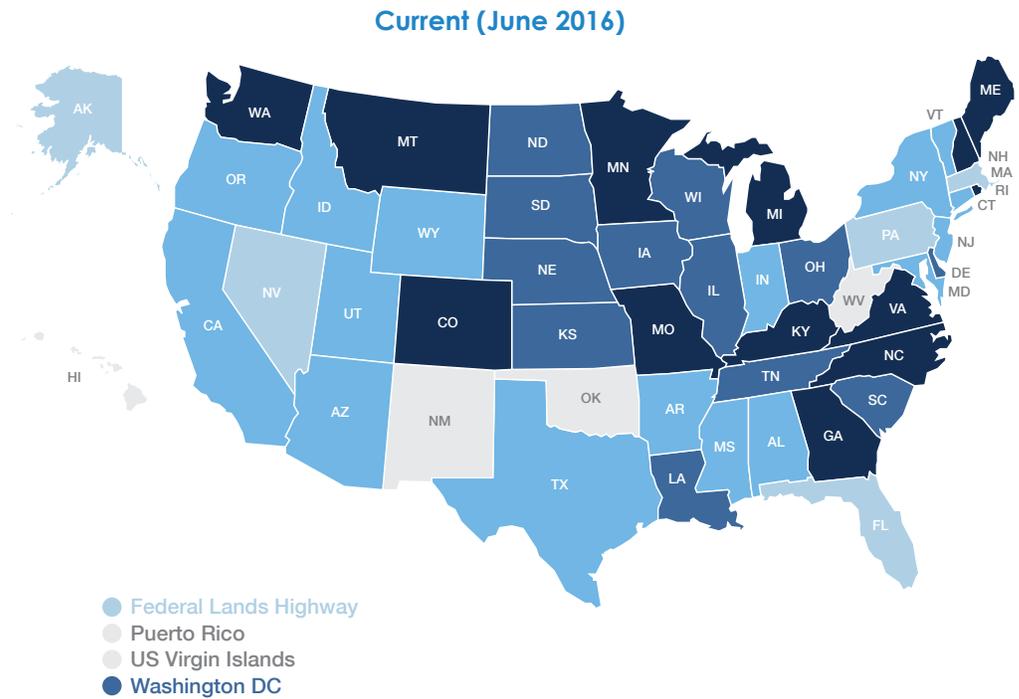


### Number of States in Various Implementation Stages

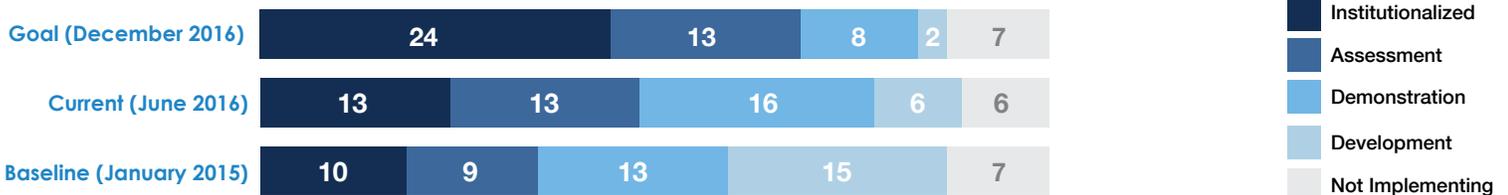


# Safety Management

Many states are pursuing the use of data-driven safety analysis to improve safety management. Twenty-eight states and Washington, D.C., are applying data-driven safety analysis to their safety management process. Thirteen states have made predictive and systemic safety analysis a standard part of their safety management process.



**Number of States in Various Implementation Stages**



# Highlights: Data-Driven Safety Analysis

## Arizona

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The **Arizona** DOT is conducting a study called “Incorporating Safety Performance Into Project Design Decision-Making for Cost-Effective Safety Enhancements” that will illustrate an approach for integrating the AASHTO **Highway Safety Manual** predictive method in the Arizona DOT project development process. Data mapping for road segments, ramps and intersections is underway to implement the AASHTOWare **Safety Analyst** tool.

## Colorado

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The **Colorado** DOT implemented a **Transportation Systems Management and Operations Evaluation** process for all agency projects. The evaluation incorporates predictive safety analysis along with operations and system engineering analyses in the project development process. The agency updated safety performance functions—statistical models used to estimate average crash frequency—for all Colorado highway segments. It used the safety performance functions to conduct a statewide network screening of level of service of safety, which identified areas where crash frequencies are higher than expected.

## Connecticut

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The **Connecticut** DOT developed a safety analysis strategic plan to provide a roadmap to advance safety analysis techniques similar to those in the AASHTO Highway Safety Manual. It is supported by analytic tools and resources such as the FHWA **Interactive Highway Safety Design Model** and ASHTOWare Safety Analyst software.

## Federal Lands Highway

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**Federal Lands Highway** is evaluating safety analysis software packages for use with the National Park Service Safety Management System. The choice will be based on the needs of users, which include safety engineers, planners and rangers. Federal Lands Highway is also collecting data on the National Park Service road network, including high-volume urban roads and low-volume rural and local roads.

## Illinois

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The **Illinois** DOT developed safety performance functions to perform system screening and identify roadways with high potential for safety improvement. The agency calibrated Illinois crash data, developed safety performance functions that can be used to predict crashes and incorporated them into its crash prediction tool.

## Louisiana

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The **Louisiana** Department of Transportation and Development is working to use data-driven safety analysis more effectively in its network screening for Highway Safety Improvement Program projects. The agency drafted a new project selection guide that includes a feasibility form for safety projects. Designers use the FHWA Interactive Highway Safety Design Model regularly and are moving toward performance-based design using safety analysis. The agency let two districtwide projects for systemic safety improvements on curves, including high-friction surface treatments.

# Highlights: Data-Driven Safety Analysis

## Maine

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The **Maine** DOT dedicated part of its Highway Safety Improvement Program funding to projects that incorporate the systemic approach to safety. The state's first phase of systemic analysis focused on centerline rumble strip needs. The agency has a rumble strip installation plan in place for 2016, with additional corridors scheduled for 2017 and 2018. The Maine DOT is assessing data on roadway departure crashes, degree of roadway curvature and superelevation of curves for potential systemic safety opportunities.

## Montana

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In Montana, all projects more extensive than pavement preservation receive a safety analysis. The **Montana** DOT updated its data analysis capabilities with a new Safety Information Management System. It also developed a Roadway Departure Implementation Plan that includes Montana-specific safety performance functions and diagnostic norms for rural roads for total crashes and roadway departure crashes. Intersection safety performance functions and diagnostic norms are under development.

## New Jersey

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AASHTO Highway Safety Manual analysis tools helped the **New Jersey** DOT prioritize projects to fund under its Local Safety Program in fiscal years 2016 and 2017. The New Jersey DOT provides technical assistance to metropolitan planning organizations as they conduct Highway Safety Manual analyses for their projects. The agency established a pilot program to fund one roundabout each for counties that meet the criteria it established.

## North Dakota

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The **North Dakota** DOT developed Local Road Safety Plans for the state's counties and major cities that include a systemic approach to safety improvements and dedicated funds to local safety projects. The agency is now implementing projects developed during the planning process. The North Dakota DOT plans to adopt a Highway Safety Improvement Program implementation plan that includes a systemic safety analysis process for the state highway system.

## Ohio

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The **Ohio** DOT is incorporating predictive crash analysis into its project development process so safety will be considered in all project planning, from minor resurfacing to major construction projects. The agency created safety-integrated project maps that identify priority locations where safety improvements should be considered on projects that overlap these areas.

The Ohio DOT is partnering with the Mid-Ohio Regional Planning Commission on a pilot project to use the Safety Analyst tool on a regional level. Using the software could bring the regional commission's crash analysis methods in line with AASHTO Highway Safety Manual and Ohio DOT best practices.

## Pennsylvania

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The **Pennsylvania** DOT completed state and regional safety performance functions for 15 rural and urban road segment and intersection types to define its guidance for using Highway Safety Manual analysis methods. It created an analytical tool for evaluating segments and intersections with the new functions. It is now adding the AASHTO Highway Safety Manual to project development and selection stages.

The Pennsylvania DOT developed a Highway Safety Manual class to teach transportation professionals how to use the new state-specific safety performance functions. The class provides students with real-world examples and demonstrates computer applications for using the Highway Safety Manual for traffic studies, design exceptions and alternatives analysis.

## Tennessee

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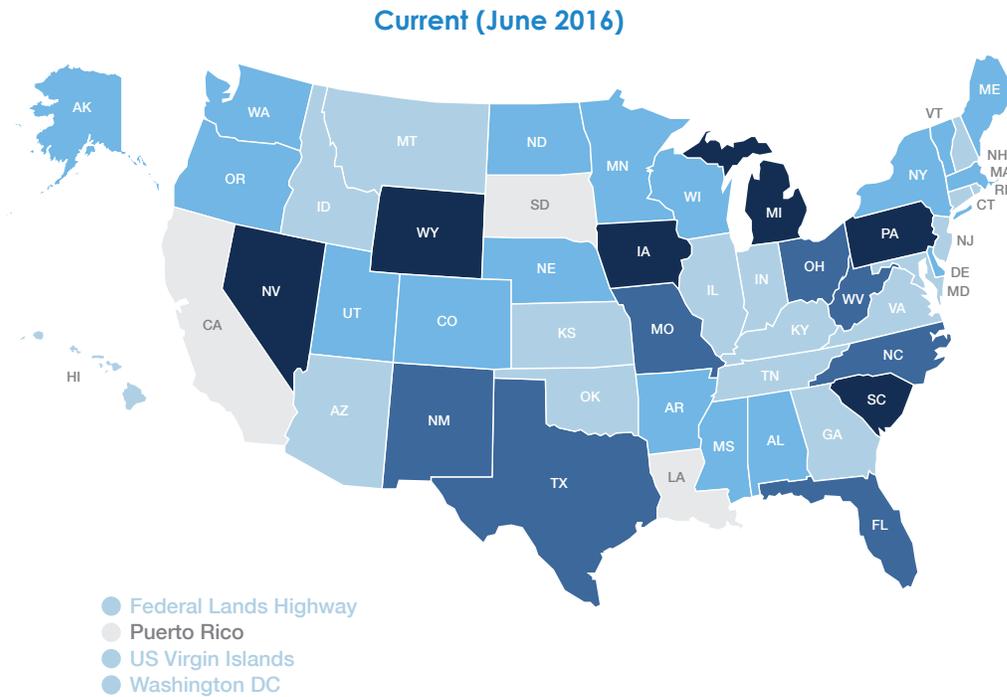
To prepare for implementation of the AASHTO Highway Safety Manual to evaluate highway safety performance, a **Tennessee** DOT team will develop changes to agency workflows and processes. The team will review obstacles and issues and recommend which components of the manual to implement to improve Tennessee DOT processes. The agency also developed a list of crash modification factors from the **Crash Modification Factors Clearinghouse** database to incorporate into safety projects. The factors can be used to identify appropriate safety countermeasures for a site.

# e-Construction

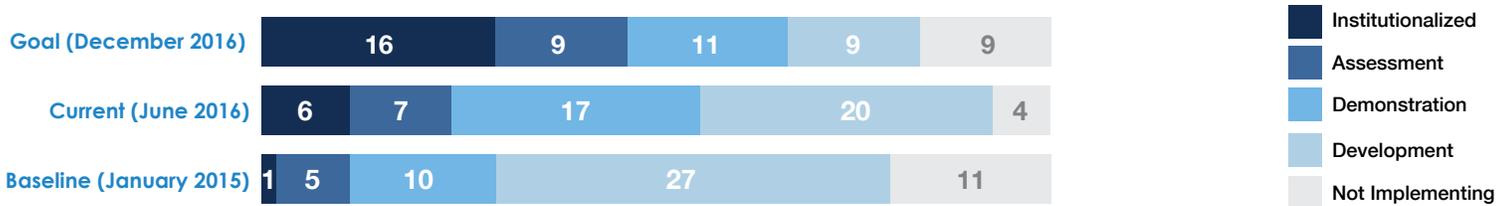
FHWA is encouraging transportation agencies to exchange the paper-based approach to construction document management with **e-Construction**—the collection, review, approval and distribution of construction documents in a paperless environment. The EDC effort involves using readily available technologies to improve construction document management.

e-Construction saves money by decreasing paper use, printing and document storage costs and time by reducing communication delays and transmittal time. It improves communication by allowing faster approvals, increased accuracy and better document tracking. e-Construction is also an **AASHTO Innovation Initiative focus technology**.

Using a paperless approach to project document management is generating interest across the country. Six states have made e-Construction a mainstream practice. An additional 24 states are using e-Construction tools.



**Number of States in Various Implementation Stages**



# Highlights: e-Construction

## Arizona

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The **Arizona** DOT uses electronic signature technology for construction contract documents, which allows faster turnaround time between the agency and contractors. Plans and specifications for projects are now advertised on the Arizona DOT website and are available in a digital format for download. As a result, the agency has reduced its use of paper plan sets by more than 30 percent.

## Arkansas

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The **Arkansas** State Highway and Transportation Department is conducting a pilot program that uses a digital contracting system as a document management, collaboration and e-signature tool for construction-related documentation on projects. Nine projects are underway and five more are planned. The agency reports that contractors on the projects have been receptive to using e-Construction.

## Colorado

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The **Colorado** DOT is expanding its e-Construction program and conducting a number of initiatives. The agency is deploying software for use on construction and right-of-way documents and using electronic plan sets, digital signatures and electronic maintenance work orders.

The Colorado DOT has also launched several e-Construction pilots. One is a construction management application that allows project engineers to input construction data such as daily reports and weather and sync the information to the software used with contractors. Another pilot is an e-ticketing project to evaluate technology that could eliminate 140,000 asphalt tickets collected at jobsites every year. The agency is also assessing software that could replace the paper process it uses to prequalify construction contractors who want to work with the agency.

## Connecticut

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In Connecticut, using mobile devices has allowed project inspectors to access the construction reporting system and other resources in the field, reducing travel time and increasing productivity. The **Connecticut** DOT implemented the use of electronic signatures on internal documents, reducing transit time and eliminating thousands of printed pages. The agency piloted the use of digital signatures externally on construction orders signed by the project engineer, supervising engineer and contractor, cutting a 20-to-30-day approval process to three to five days.

## Florida

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The **Florida** DOT will use an e-Construction documentation process for all construction contracts after July 1, 2016. The agency conducted webinars to train stakeholders on the use of its collaboration tool for conducting business in a paperless environment. After completing a pilot project to test a mobile device manager for tablets, the department is ready to deploy tablets statewide. The Florida DOT updated its construction standard specifications to reflect e-Construction implementation and developed an **e-Construction How-To Guide** for stakeholders.

## Iowa

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The **Iowa** DOT is now 99 percent paperless on construction projects from the pre- to post-construction stages. When the agency implements digitally signed contracts in August 2016, it will be 100 percent paperless. The Iowa DOT started using mapping software on its tablets to collect location data on pavement cores and samples and post-construction documentation on culverts, signs and traffic signals. It began its second pilot project on paperless tickets for hot-mix asphalt at jobsites and plans to develop a specification in 2017. The agency is working on a return-on-investment summary to quantify its savings with e-Construction use.

# Highlights: e-Construction

## Massachusetts

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The **Massachusetts** DOT developed a process for an electronic inspector's daily report for use on megaprojects and is selecting pilot projects for expanding the process to smaller projects. The agency is piloting e-Construction technologies on two projects. On the I-91 Viaduct project in Springfield, the agency and contractor are using a software service for project document sharing and storage. On the Commonwealth Avenue Bridge project in Boston, radio-frequency identification tags and sample barcoding are being used for precast concrete elements.

## Mississippi

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The **Mississippi** DOT now requires all contractors to use electronic bidding on road and bridge projects. The agency is populating data tables for use in the AASHTOWare **Project** tool and plans to begin testing it in 2017. It is also developing an application to streamline the processing of pay items and quantities on projects.

## Missouri

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The **Missouri** DOT is beginning implementation of E-Project, a strategy to move all document storage and management to a web application. The majority of construction inspectors, technicians and resident engineers use mobile devices in the field. The Missouri DOT is conducting a pilot project to evaluate pdf software for marked-up as-built construction plans. The pilot is designed to identify the time the software saves in completing as-built plans as well as its uses for other aspects of e-Construction.

## Pennsylvania

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The **Pennsylvania** DOT uses its Project Collaboration Center, a web-based document management system, on all new projects. Pennsylvania's **Engineering and Construction Management System** website includes a construction documentation system that allows for input of project site activities and generates estimated payments and project work orders. Construction staff throughout the state use tablets for field data collection. Among the applications users can access are one that downloads plans, specifications and standards for each project and one that provides a punch list inspectors can use to check the status of items.

## Texas

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The **Texas** DOT e-Construction program consists of multiple software applications at various implementation stages. The agency is calculating implementation costs and time and money savings for e-Construction. Examples of changes that have been made at no cost to the state include advertising requests for proposals online rather than printing copies and requiring contractors to submit prequalification forms electronically.

## Utah

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The **Utah** DOT received AID Demonstration funds to develop and implement a paperless contractor registration, disadvantaged business enterprise certification and prequalification application that will be piloted on about five projects. The pilot is intended to demonstrate technology that optimizes and expedites workflows under a single electronic system.

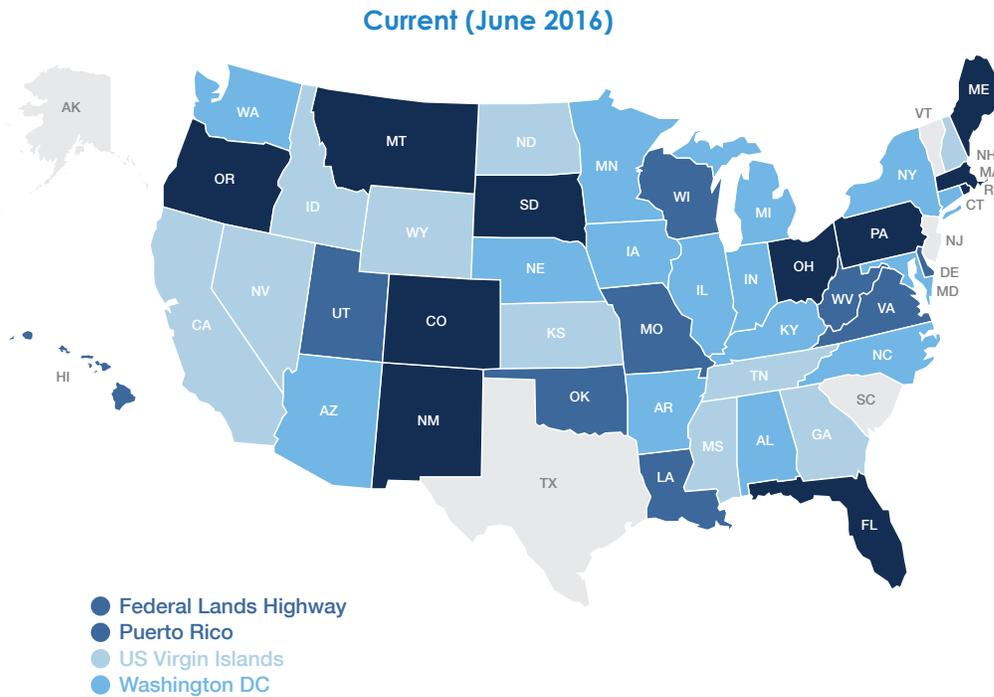


# Geosynthetic Reinforced Soil-Integrated Bridge System

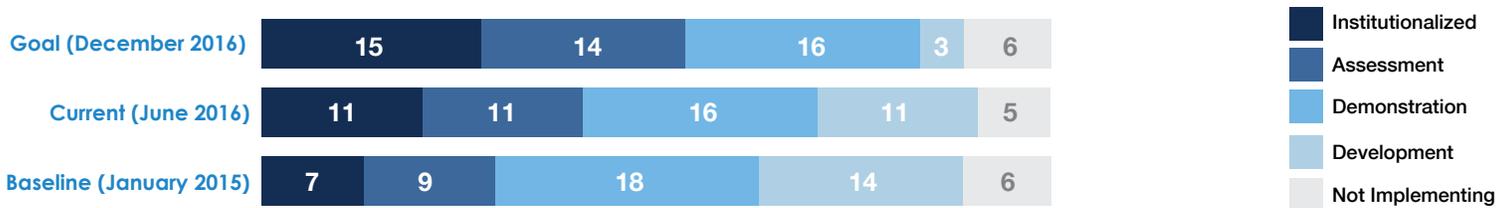
**Geosynthetic reinforced soil-integrated bridge system** technology can help meet the country's demand for small, single-span bridges by delivering low-cost, durable structures that can be constructed with readily available equipment and materials. A GRS-IBS project can be built in weeks instead of months, saving time and cutting work zone congestion.

GRS-IBS bridges can cost 25 to 60 percent less than bridges built with conventional methods. They use a simple design that can be adapted to suit environmental or other needs. The technology integrates the roadway approach to the bridge, eliminating the bump drivers commonly feel between the road and the bridge.

Interest continues to grow in GRS-IBS, an EDC innovation since 2011. Eleven states have adopted GRS-IBS technology as a standard practice and use it regularly where appropriate. An additional 24 states, Washington, D.C., Puerto Rico and Federal Lands Highway have used GRS-IBS on projects or are preparing for full deployment of the technology.



**Number of States in Various Implementation Stages**



# Highlights: Geosynthetic Reinforced Soil-Integrated Bridge System

## Arizona

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The **Arizona** DOT is using funds from the STIC Incentive program to develop GRS-IBS specifications. The specifications, which include a contractor quality control plan and guidance for designers, will help the agency incorporate GRS-IBS structures into its bridge inventory where appropriate.

## Arkansas

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Design is nearing completion on a project that will use GRS-IBS technology to replace a bridge on West College Avenue over Christian Creek in Jonesboro. The project received a grant from the AID Demonstration program. FHWA staff provided technical assistance on a seismic global stability issue on the project. The city of Jonesboro plans to consider GRS-IBS construction for future bridges involving small channel crossings.

## Connecticut

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Connecticut has eight projects using GRS-IBS abutments under construction or at the design stage. The state's first GRS-IBS project is under construction as part of a shared-use path in Manchester. The **Connecticut** DOT is using GRS-IBS on another Manchester project to replace a bridge on an I-84 exit ramp. On the first phase of the I-84 project, the GRS-IBS abutments were built within three weeks of excavation, a significantly shorter time frame than expected for conventional abutment construction. On both projects, the agency is installing instrumentation to monitor the bridges over time and documenting GRS-IBS construction with time-lapse video to share with the highway community.

## Federal Lands Highway

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**Federal Lands Highway** completed three GRS-IBS projects, including the Beckwourth-Genesee Road bridge in the Plumas National Forest in California, County Road 47 Spur bridge over the Little Thompson River in Colorado and Province Lands Road bridges at Cape Cod National Seashore in Massachusetts. Planning and design work continue for 12 additional projects.

Federal Lands Highway, in cooperation with the Gwichyaa Zhee Gwich'in tribal nation, is constructing the Ivar's Road Bridge project in Fort Yukon, which will include the longest GRS-IBS span built to date at 150 feet. The project, 11 miles north of the Arctic Circle, will test GRS-IBS technology in a harsh environment with a record high of 100 F and a record low of minus 78 F.

## Florida

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The **Florida** DOT considers the use of GRS-IBS at all bridge project locations where the technology is appropriate. The agency's Central Office performed a quality assurance review to assure that all districts include consideration of GRS-IBS when planning projects. The Florida DOT is working on an in-house design for a 90-foot bridge using GRS-IBS.

## Indiana

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State and local officials observed GRS-IBS construction at a June showcase in Noblesville hosted by the Hamilton County Highway Department, Indiana Local Technical Assistance Program and FHWA. Hamilton County built its first GRS-IBS bridge in 2015 and has three more under construction. FHWA is providing technical assistance to the county throughout the project development and construction phases.

# Highlights: Geosynthetic Reinforced Soil-Integrated Bridge System

## North Carolina

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The **North Carolina** DOT has begun construction on a project to replace a bridge over Big Branch Creek on Rocky Mount Church Road in Anson County with a new 60-foot bridge. The superstructure is a precast cored slab set on GRS abutments. FHWA conducted training on GRS-IBS for the construction team working on the project.

## Oregon

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The **Oregon** DOT incorporated GRS-IBS design guidance in its **Geotechnical Design Manual** and gave a presentation on the topic at the Oregon DOT Bridge Design Conference in May 2016. The agency is looking for a candidate project to demonstrate the use of this technology.

## Pennsylvania

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GRS-IBS technology is fully implemented in Pennsylvania. It has been incorporated into the **Pennsylvania** DOT's publications and standards and is considered a tool in its construction toolbox. Pennsylvania DOT districts and local agencies are installing GRS bridges on their own, without added guidance from the Central Office.

## South Dakota

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The **South Dakota** DOT has made use of GRS-IBS technology an option on projects to replace local bridges and published guidance and design information. One local project—a bridge replacement in Custer County—has used GRS-IBS so far, but increased state funding for local bridges is expected to generate interest in using the technology on future projects.

## Washington, D.C.

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The **District** DOT reports that using GRS-IBS technology on bridge projects can save about \$200,000 in project costs and \$125,000 in time costs. The agency's first use of GRS-IBS was on a project to replace the 27th Street Bridge over Broad Branch.

## Wisconsin

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Work is underway on a project to use GRS-IBS on two bridges in Dodge County, the first GRS-IBS project on a local highway in Wisconsin. The project received a grant from the AID Demonstration program. As part of the project, the **Wisconsin** DOT partnered with Dodge County, Wisconsin's Local Technical Assistance Program and FHWA on a showcase to demonstrate GRS-IBS construction to other local agencies and private sector organizations.

# Improving Collaboration and Quality Environmental Documentation

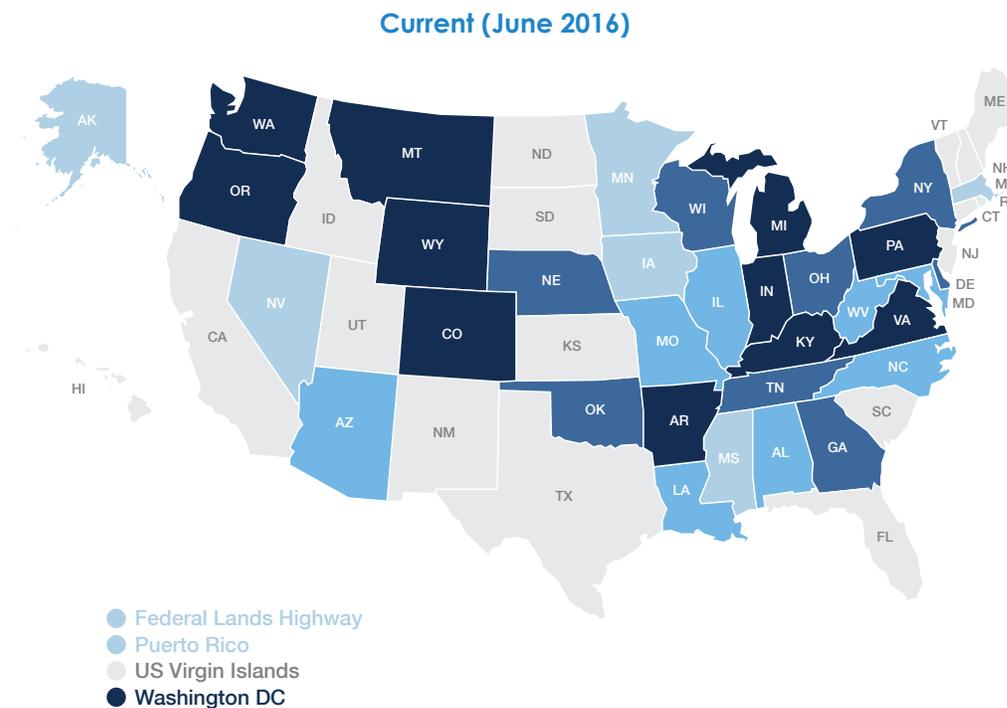
Shortening the time needed for National Environmental Policy Act approval for construction projects is a core need of the transportation community. Through the **improving collaboration and quality environmental documentation** effort, EDC-3 supports tools to foster collaborative, timely and transparent interagency reviews that can cut the amount of work and resources required for, save time and money on, and improve the quality of NEPA documents for projects.

The implementing quality environmental documentation, or IQED, effort that started in EDC-2 promotes best practices for simplifying and expediting the development of environmental documents. EDC-3 also incorporates eNEPA, an online workflow tool FHWA created for projects that require an environmental impact statement or environmental assessment.

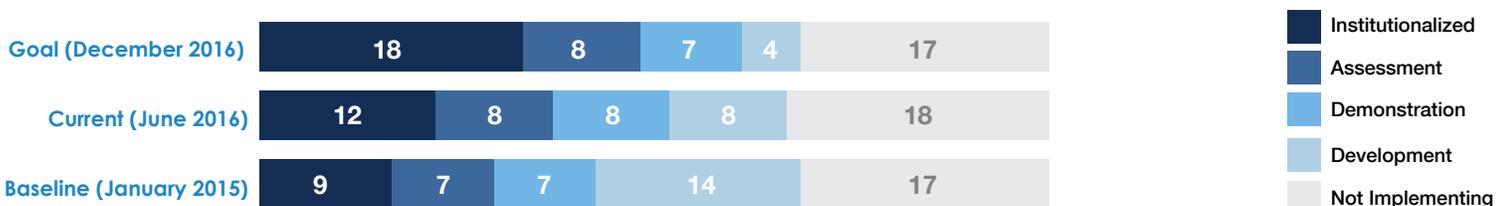
For EDC-3 progress reporting, the eNEPA implementation stages are based on deployment of eNEPA or any other form of electronic documentation and collaboration system. A documentation and collaboration system is defined as an electronic document-sharing system that facilitates collaboration between two or more agencies.

## IQED

Strategies to implement quality environmental documentation are now a mainstream practice in 11 states and Washington, D.C. Sixteen states have piloted the use of IQED principles on NEPA documents or are preparing for full deployment of IQED.

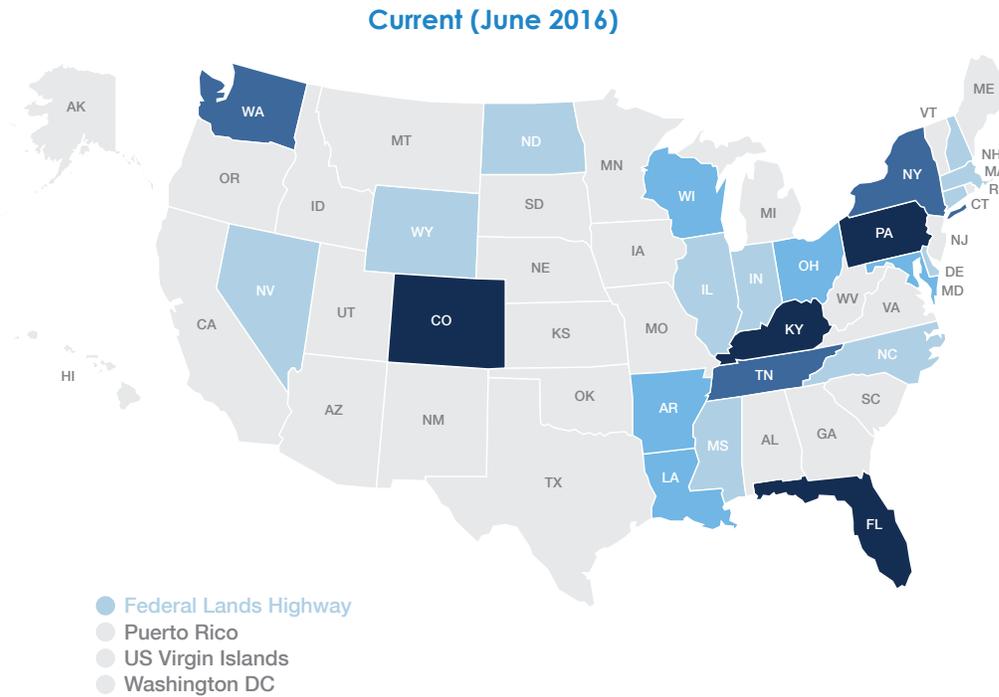


### Number of States in Various Implementation Stages



# eNEPA

Conducting NEPA review processes electronically is now a standard practice in four states. Eight states are demonstrating and assessing eNEPA or another documentation and collaboration system.



### Number of States in Various Implementation Stages



# Highlights: Improving Collaboration and Quality Environmental Documentation

## Alaska

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The **Alaska** Department of Transportation and Public Facilities is working on an Environmental Procedures Manual that incorporates IQED principles, including developing clear, concise documents that tell the project story, keeping documents brief and ensuring that they meet legal requirements. The agency plans to complete the manual in 2017.

## Arizona

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The **Arizona** DOT is using a project checklist to shorten the processing time for categorical exclusions—actions that do not involve significant environmental impacts—and streamline the environmental review and approval process. Using the categorical exclusion checklist has reduced the risk of the environmental process causing delays and resulted in more timely delivery of projects.

The Arizona DOT rolled out a quality assurance/quality control process for environmental documents to help streamline reviews and approvals. The process promotes early and continuous coordination among project team members to identify and resolve schedule challenges. The agency is working on a reference tool for local agencies to guide them through the process of developing quality environmental documents, which is expected to reduce errors and the time needed for reviews and revisions.

## Federal Lands Highway

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**Federal Lands Highway** applies IQED principles on all projects to keep environmental documentation brief while ensuring legal sufficiency. Its environmental assessment for a project to improve Raphune Hill Road and Route 381 in the U.S. Virgin Islands is 32 pages and incorporates visualizations to help tell the project story. Federal Lands Highway identified a project in Chincoteague National Wildlife Refuge in Virginia to pilot the use of eNEPA and is working with the U.S. Fish and Wildlife Service to integrate the agency into the process.

## Illinois

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The **Illinois** DOT is collaborating with FHWA to develop templates for environmental assessments and environmental impact statements to help those who produce the documents make them clear, concise, consistent and legally sound. The Illinois DOT also worked with FHWA to update the environmental policy chapters of the **Bureau of Design and Environment Manual** to include IQED principles and processes.

## Mississippi

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The **Mississippi** DOT is collaborating with FHWA to finalize an Environmental Policy Manual and a local agency training course on transportation project reviews under Section 106 of the National Historic Preservation Act. The Mississippi DOT received STIC Incentive program funds to develop the manual and training instructional materials.

# Highlights: Improving Collaboration and Quality Environmental Documentation

## Nevada

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The **Nevada** DOT is collecting guidance and best practices and building stakeholder support for pursuing IQED. Staff from the Nevada DOT, metropolitan planning organizations and municipalities participated in training on using eNEPA to conduct environmental reviews electronically. The Nevada DOT plans to pilot eNEPA on a future construction project requiring an environmental impact statement.

## Ohio

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The **Ohio** DOT is finalizing its guidance on how to improve the quality and streamline the production of two environmental documents critical in project development: feasibility studies and alternative evaluation reports. The Ohio DOT will use the guidance, which it plans to roll out in summer 2016, to produce reader-friendly documents that ensure efficient decision making. The agency added the guidance document to the topics covered in its project development process training and developed a web-based training class.

## Washington

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The **Washington** State DOT uses several tools to improve the quality of environmental documentation, including a **Reader-Friendly Document Toolkit**, **Environmental Manual**, quality assurance framework and library of example NEPA documents. The agency updated and improved its documentation, database and guidance for state and local projects with categorical exclusions. As part of its implementation of the **Practical Design** concept, the Washington State DOT is focusing on improving community engagement in its project processes, especially during the planning, environment and design phases.

## Wisconsin

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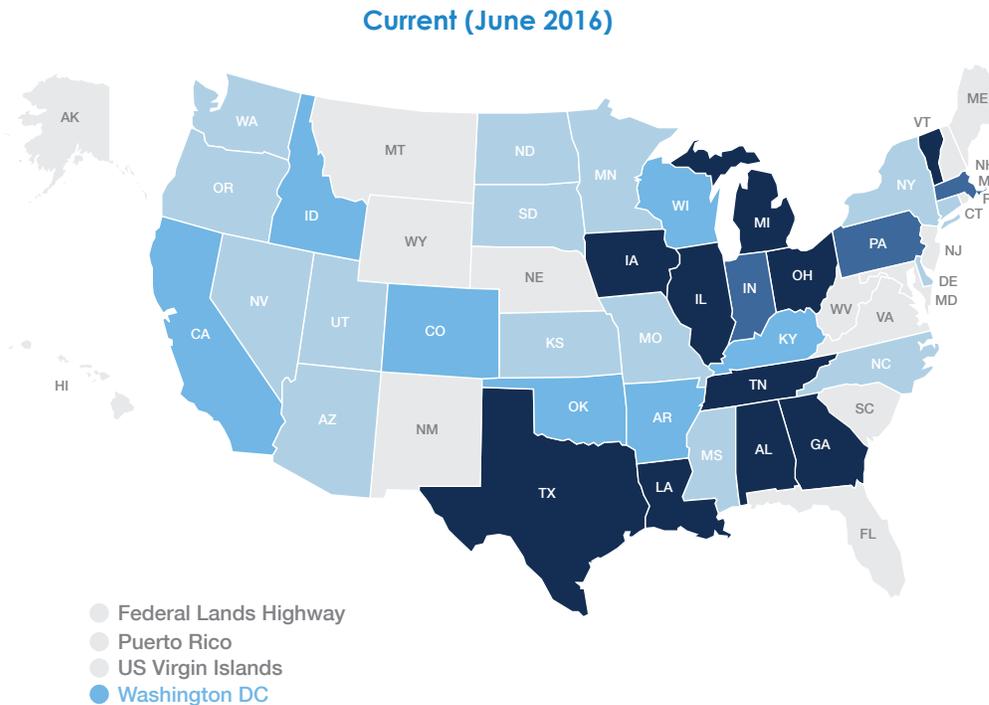
The **Wisconsin** DOT is finalizing updates to the environmental chapters of its Facilities Development Manual to include IQED principles. The agency incorporated IQED principles into its environmental training sessions for staff in the agency's five regions and offered eight sessions across the state during the spring 2016 training cycle.

# Improving DOT and Railroad Coordination

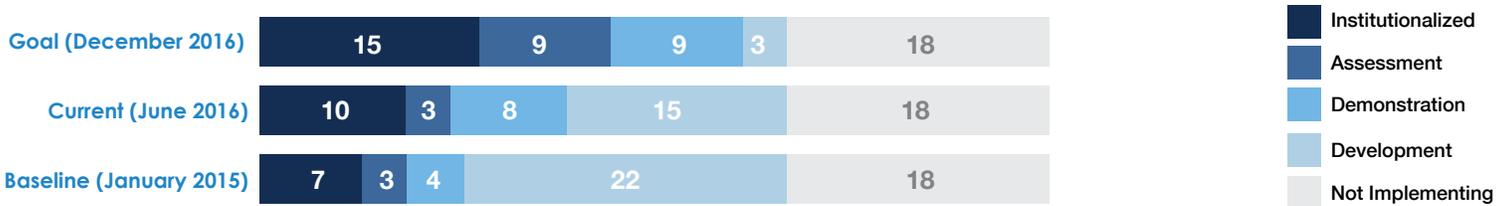
Each year, transportation departments build hundreds of projects near railroad rights-of-way. With railroad volumes projected to grow, the need for project coordination between DOTs and railroads will also increase. Improving collaboration and streamlining processes will save money and time for highway agencies and railroads and result in faster, smarter highway renewal.

The EDC-3 effort on **improving DOT and railroad coordination** encourages agencies and railroads to identify issues and negotiate agreements to expedite development of highway projects involving railroad rights-of-way. It uses a model agreement library, tools and training developed under the **SHRP2 R16 project**, which enables agencies and railroads to identify sources of conflict and develop memorandums of understanding for project and program needs.

Ten states have institutionalized the use of tools and practices to improve DOT and railroad coordination. Another 10 states and Washington, D.C., are piloting the innovation or preparing for full deployment.



## Number of States in Various Implementation Stages



# Highlights: Improving DOT and Railroad Coordination

## Alabama

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**Alabama** DOT, railroad, county and FHWA staff visited eight railroad crossings for demonstrations on how to evaluate the crossings on the adequacy of existing or proposed signals or warning devices for highway traffic. The goal of the demonstrations was to train local officials how to conduct evaluations themselves. Several railroads have agreed to participate in future evaluations, which is expected to lead to determinations on the adequacy of signals and warning devices earlier in the project development process.

## Arizona

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Coordination with railroad partners helped a project to build a new Bell Road bridge over U.S. 60 and adjacent railroad tracks in Surprise move from design to construction within a year. The **Arizona** DOT is using a full closure of Bell Road to reduce the project's length and lessen construction impact on travelers.

## Colorado

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The **Colorado** DOT is finalizing a master agreement with BNSF Railway. The agency is also developing a construction and maintenance template for projects on or near areas with railroad rights-of-way that includes a flow chart of design and contract processes with time lines.

## Connecticut

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The **Connecticut** DOT regularly uses two master agreements with Amtrak. One agreement is specific to the Hartford Line and allows the Connecticut DOT to give direction on work elements quickly with a project authorization letter. The other is a blanket agreement for all Connecticut DOT work that involves Amtrak right-of-way that allows work to proceed with a project authorization letter. Preparation and execution of the letter can be accomplished in under a month, while developing a traditional formal agreement can take more than a year.

## Delaware

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The **Delaware** DOT is using SHRP2 funds to develop master agreements with the seven railroad companies it works with to streamline the process for construction projects. The agency signed a maintenance agreement with Norfolk Southern Railway for railroad crossings within the work limits of highway projects.

## Iowa

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The **Iowa** DOT has standard specifications for work on or near Union Pacific Railroad, Canadian Northern Railway and Canadian Pacific Railway property. The agency is finalizing specifications for work involving BNSF Railway property and developing specifications for short-line railroads in the state.

# Highlights: Improving DOT and Railroad Coordination

## Michigan

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The **Michigan** DOT has master agreements with most of the railroads that operate in the state. The agreements cover the selection, design, construction, funding and administration of railroad-highway grade crossing improvement projects.

## South Dakota

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The **South Dakota** DOT launched a project to update its policies on railroad-related highway projects. The agency met with railroads and other stakeholders to discuss the project, get input and outline action items to pursue.

## Tennessee

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The **Tennessee** DOT has institutionalized coordination with railroads in the state and has master agreements with CSX, Illinois Central Railway and Norfolk Southern Railway. Benefits of coordination include enhanced partnering with railroads, early identification of issues railroads may have with project plans and time savings on project development processes. For example, the Tennessee DOT worked with Norfolk Southern to streamline the process for resurfacing projects, reducing the time it takes for railroad approvals.

## Wisconsin

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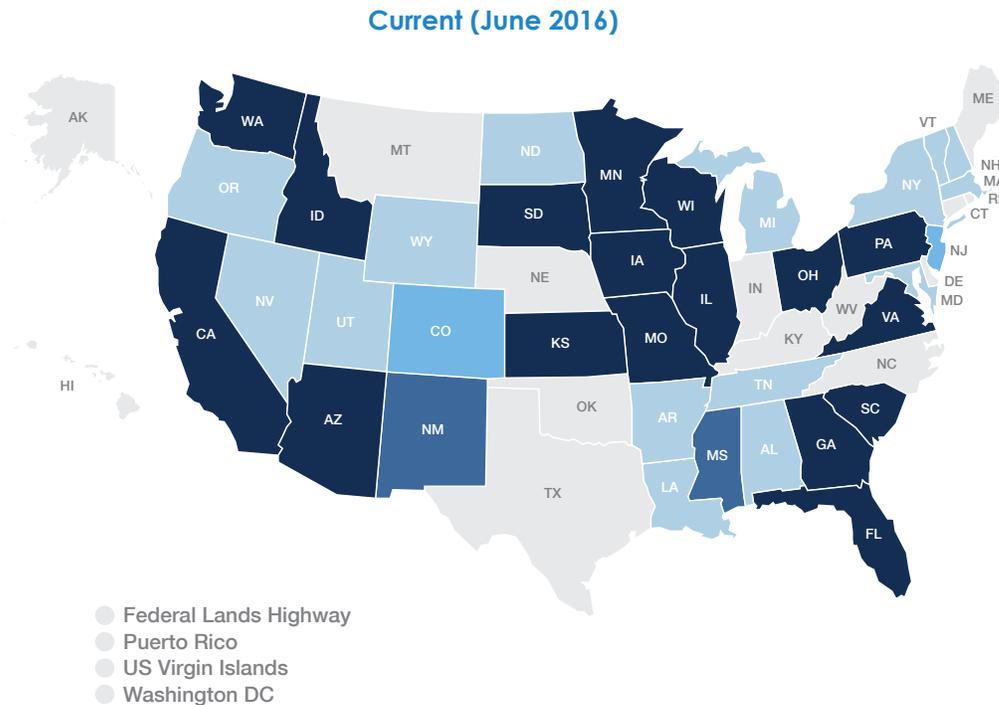
The **Wisconsin** DOT is testing a scheduling tool to show the time frames required for railroad coordination on highway projects. The goal is to create an information technology solution that tracks railroad coordination for each project. The agency provides lists of upcoming projects to affected railroads to enable them to better plan for the projects. It is working with Union Pacific Railroad to improve agreements and processes to address real estate concerns.

# Locally Administered Federal-Aid Projects: Stakeholder Partnering

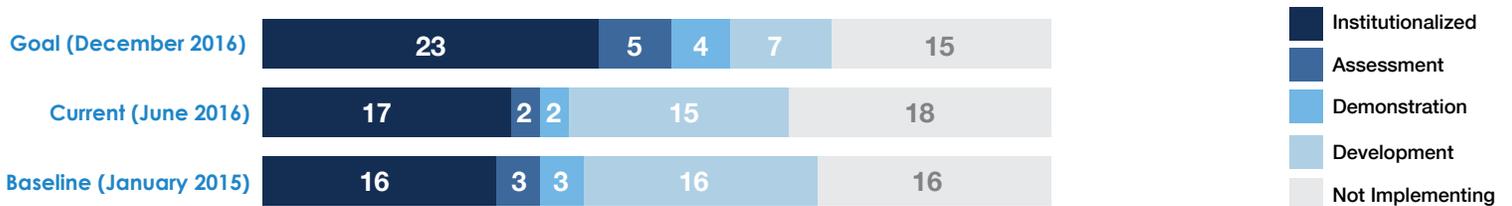
**Stakeholder partnering** brings local public agency representatives together with state and federal colleagues to increase program compliance and streamline the project delivery process under the Federal-Aid Highway Program. After promoting stakeholder partnering in EDC-2, FHWA is continuing the effort in EDC-3.

Stakeholder partnering groups meet regularly to identify program-level issues, review project development processes and work on solutions through a defined decision-making process and action plans. Stakeholder partnering improves communication and trust among those involved and increases consistency by establishing a cooperative environment for reviewing project development compliance requirements and policies. It also provides a platform to initiate process enhancements, training and other ways to improve program integrity.

Stakeholder partnering on local projects is now an institutionalized practice in 17 states. Another four states are making progress on their efforts to establish stakeholder partnering groups of local, state and federal representatives.



**Number of States in Various Implementation Stages**



# Highlights: Locally Administered Federal-Aid Projects: Stakeholder Partnering

## Arizona

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The Arizona Local Public Agency Stakeholder Council meets quarterly to enhance communication among agencies. Scoping a Federal-Aid Highway Program project was the topic of a summer 2016 meeting in Phoenix. The meeting provided local agency representatives with an opportunity to ask questions about federally funded projects, express concerns and offer suggestions. The **Arizona** DOT created a stakeholder council **webpage** and is conducting a stakeholder partnering awareness campaign that includes presentations at industry meetings and events.

## Maryland

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The **Maryland** State Highway Administration is moving forward on its efforts to establish a local agency council to improve delivery and oversight of local projects under the Federal-Aid Highway Program. The council's first meeting is planned for 2016. The agency completed a local public agency manual that it plans to publish in 2016.

## Missouri

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In Missouri, where stakeholder partnering is institutionalized, the Local Public Agency Advisory Committee has generated benefits such as better communication and stronger working relationships between local agencies and the **Missouri** DOT. Among the topics committee members discussed at the first quarterly meeting of 2016 were right-of-way acquisition issues, updates to the Local Public Agency Manual, and consistency in plan, specification and estimate submittals.

## New Hampshire

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The **New Hampshire** DOT is developing a strategy for setting up and working with a stakeholder partnering group that includes representatives of local agencies, regional planning commissions and private industry. The purpose of the group is to enhance communication, improve understanding of local agency programs and processes, and identify areas for improvements. The New Hampshire DOT participated in an EDC Exchange on stakeholder partnering to learn about other states' challenges and successes in establishing stakeholder partnering groups.

## New Jersey

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Members of the **New Jersey** DOT's stakeholder partnering committee represent metropolitan planning organizations, counties, municipalities, private industry and FHWA. A committee workshop on inactive Federal-Aid Highway Program projects enabled stakeholders from 24 organizations to discuss inactive project causes and potential solutions. They created several working groups to evaluate why projects may not be awarded, billed and completed in a timely manner and develop recommendations to improve the project delivery process.

## Ohio

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The Ohio Local Public Agency Advisory Group conducted its first **survey** of local public agencies. The **Ohio** DOT is using the survey results to plan agendas for Local Public Agency Days in the agency's 12 districts in fall 2016. The day-long sessions will focus on helping local agencies deploy e-Construction, data-driven safety analysis and road diets. In addition, the Ohio DOT is researching opportunities to improve Ohio's Local Let process identified in the survey results and developing streamlining efforts for implementation. The Ohio DOT launched a **website** and worked with FHWA to create a **video** to enhance communication about the Local Public Agency Advisory Group.

## Oregon

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The **Oregon** DOT Local Program Leadership Team, which includes representatives from the Association of Oregon Counties and League of Oregon Cities, is looking at ways to improve local program delivery. The Oregon DOT created a user's group for its **Local Agency Certification Program** for delivering federally funded projects. The agency collaborated with local agencies on workshops to improve coordination and delivery of local projects.

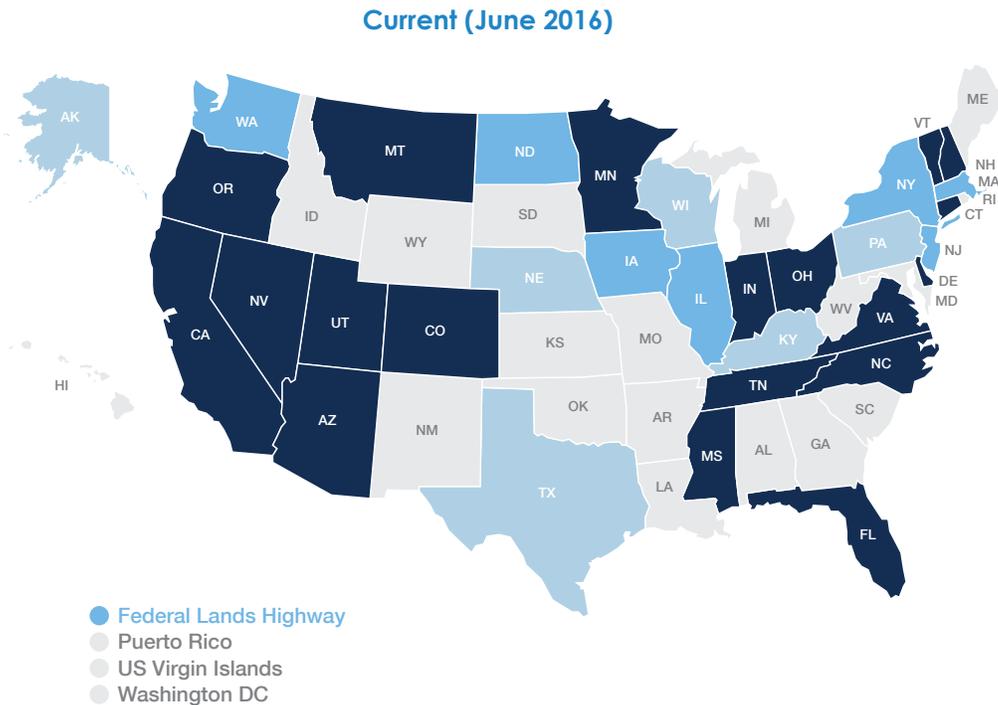
# Regional Models of Cooperation

Although traffic congestion does not stop at geographic borders, transportation planning often does. Using **regional models of cooperation** can help state highway agencies, regional planning groups and other stakeholders develop agreements and coordinate planning across jurisdictional boundaries.

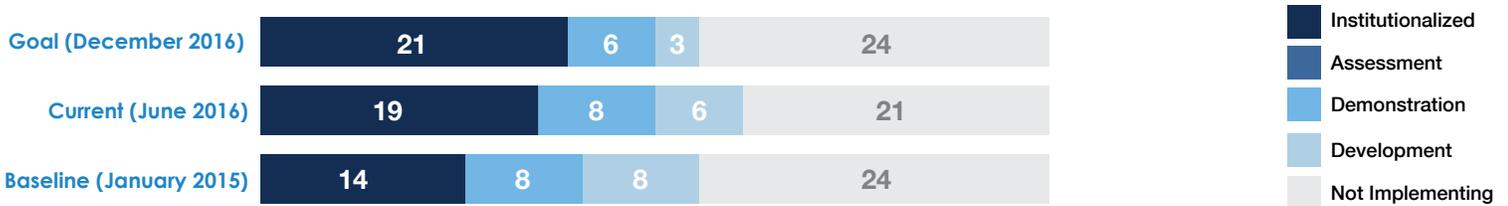
In EDC-3, FHWA is promoting a framework and process for developing agreements across agency boundaries, improving communication, collaboration, policy implementation and performance management. Regional models of cooperation can yield benefits such as faster project delivery, less traffic congestion and more efficient freight movement.

## Planning Products and Studies Across Agencies

Use of regional planning on highway, transit, freight, air quality, congestion mitigation and other transportation issues is institutionalized in 19 states. Metropolitan planning organizations, state transportation departments and other stakeholders in seven states and Federal Lands Highway are at the demonstration stage on the innovation.

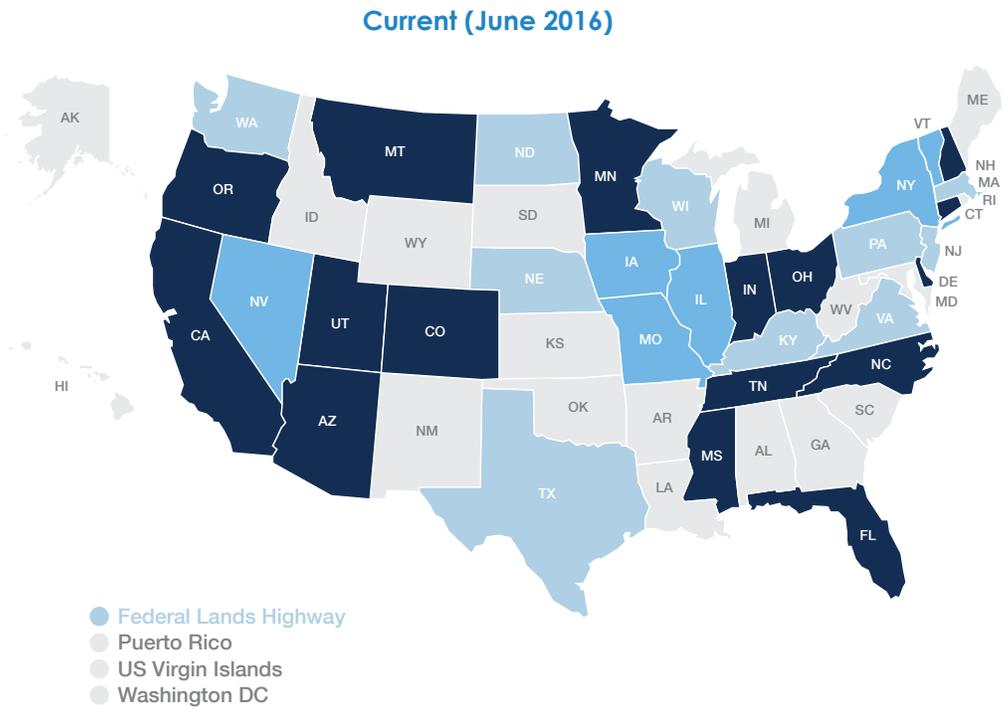


**Number of States in Various Implementation Stages**

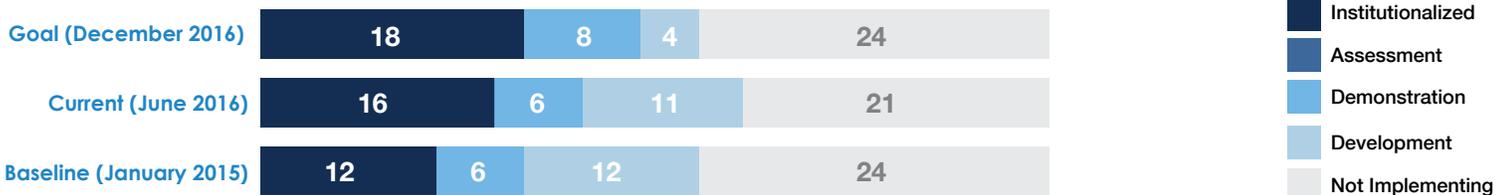


# Data Models and Tools

Metropolitan planning organizations, state transportation departments and other stakeholders in 16 states have institutionalized the sharing of data, models and tools such as geographic information systems, transportation models, safety data and asset management information. Another six states are conducting demonstration projects.



**Number of States in Various Implementation Stages**



# Highlights: Regional Models of Cooperation

## Alaska

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The **Alaska** Department of Transportation and Public Facilities held a March 2016 workshop on regional models of cooperation for a diverse group of transportation stakeholders. Building on the success of the workshop, the agency regularly convenes virtual meetings with stakeholders to discuss issues that affect the state's multimodal transportation system and its users.

## Arizona

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The Joint Planning Advisory Council, a planning partnership for the Arizona Sun Corridor, meets regularly to address regional planning and economic topics. These include the **Arizona** DOT's passenger rail corridor study, border challenges and commerce flow, and creation of economic opportunities with infrastructure as a strategic investment. The council also reviewed the Sun Corridor Freight Transportation Framework Study, which evaluated ways to diversify the Sun Corridor economy through freight-related development opportunities. Study findings have been used in several planning initiatives in the Tucson metropolitan region.

Representatives of Arizona's six councils of government and eight metropolitan planning organizations meet for policy-level discussions on state and federal programs, such as options to address transportation funding shortfalls and support for extending the border zone in Arizona. The Transportation and Trade Corridor Alliance is developing a statewide foreign direct investment strategy to assess the state's assets and identify approaches to enhance investment, such as transportation infrastructure projects that have potential as public-private partnerships.

## Delaware

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A yearlong multiagency collaboration resulted in completion of the Delmarva Freight Study in March 2016. The plan summarizes planning and transportation needs to enhance freight movement in the 14-county tristate area of the Delmarva Peninsula in Delaware, Maryland and Virginia.

## Florida

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The **Florida** DOT is conducting a pilot project with four metropolitan planning organizations—Broward, Gainesville, Hillsborough and Indian River—to explore data development for transportation-related performance measures. The project will help Florida prepare to adopt national performance measures required by the FAST Act and determine how to use them to support the state's performance management needs.

The Florida DOT hosted a Performance Summit for Transportation Partners in May 2016. The objective of the summit was to obtain stakeholder input on the performance aspects of plans and programs spanning all modes of transportation. Transportation partners and stakeholders from agencies and organizations across Florida participated in the summit.

## Iowa

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Through the Iowa Standardized Model Structure project, the **Iowa** DOT is developing an electronic policy and procedure manual for metropolitan planning organizations on building and maintaining travel demand models. The goal is to provide a consistent framework of best practices for travel demand modeling. The Iowa DOT is collaborating with metropolitan planning organizations in Iowa City and Cedar Rapids on a study of transit options for commuters between the two cities.

## Missouri

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The **Missouri** DOT is collaborating with metropolitan planning organizations and other agencies to prepare for implementation of FAST Act performance measurement requirements. Activities include offering training on safety performance measurement and encouraging formation of freight advisory councils in Kansas City, Springfield and St. Louis. The Missouri DOT uses a collaboration website to facilitate information sharing with metropolitan planning organizations, regional planning commissions and DOTs in surrounding states.

# Highlights: Regional Models of Cooperation

## Nevada

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In an effort to foster a more unified statewide planning effort, the **Nevada** DOT is developing a long-range plan that incorporates plans from metropolitan planning organizations. The Nevada DOT, metropolitan planning organizations and FHWA established an Operations Management Group. One of the group's goals is to better link planning and traffic operations to improve statewide operations.

## New Jersey

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New Jersey's Complete Team brings together transportation planners and operators to facilitate regional planning, investment decision making and efficient operations. The team includes the **New Jersey** DOT, metropolitan planning organizations, FHWA, Federal Transit Administration, NJ Transit, Port Authority of New York and New Jersey, and New Jersey Turnpike Authority. The team shares best practices and discusses coordination opportunities on topics such as planning and operations, congestion relief and freight performance measures.

## New York

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The **New York** State DOT is engaging metropolitan planning organizations and other stakeholders in development of a State Freight Plan. As part of the plan development process, the agency is conducting interviews with stakeholders such as modal associations on infrastructure, regulatory and other issues that affect freight movement in the state.

The Eastern Border Transportation Coalition, which focuses on movement of people and goods between the United States and Canada, held its annual workshop in April 2016. Topics included an overview of market forces at the border and the status of border projects and programs. Coalition members include the transportation agencies of the states of Michigan, New York, Vermont and Maine and the Canadian provinces of New Brunswick, Nova Scotia, Ontario and Quebec.

The New York Metropolitan Transportation Council discussed the future of transportation in the region at its annual meeting in March 2016. The council provides a planning forum to address transportation-related issues and develop regional plans for New York City, Long Island and the lower Hudson Valley. Members reviewed strategies for leveraging transportation investments to support the region's growth and adopted the **Unified Planning Work Program** for fiscal year 2016–2017.

## Ohio

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The Miami Valley Regional Planning Commission adopted the **2040 Long-Range Transportation Plan** for the Dayton region. The plan covers multimodal transportation investments in roadway, bikeway, pedestrian and transit projects and programs. The commission develops and implements transportation plans designed to enhance growth and mobility in southwest Ohio.

## Utah

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Utah transportation agencies and metropolitan planning organizations published their third **Unified Transportation Plan**, which identifies road, transit, bike and pedestrian infrastructure needs in the state from 2015 to 2040. The **Utah** DOT, Utah Transit Authority and metropolitan planning organizations developed the financial, demographic and growth assumptions used in the plan and agreed on performance measures to gauge success.

## Vermont

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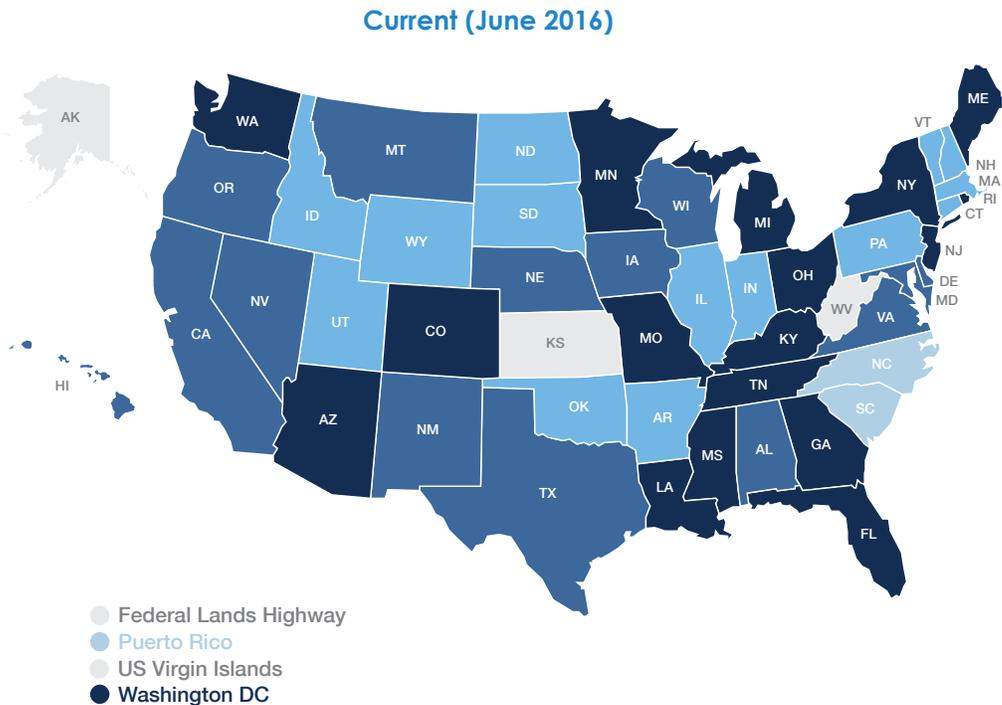
The Chittenden County Regional Planning Commission has institutionalized many aspects of transportation planning with its partners. The commission participates in planning initiatives with the **Vermont** Agency of Transportation and other regional planning commissions and transportation partners. Efforts include studies on initiating rail service between St. Albans and Montpelier and upgrading stations between Rutland and Burlington. The commission participated in development of the **Travel Smarter** web-based trip planner and **Way to Go! Vermont** program to promote efficient travel options such as carpooling.

# Road Diets (Roadway Reconfiguration)

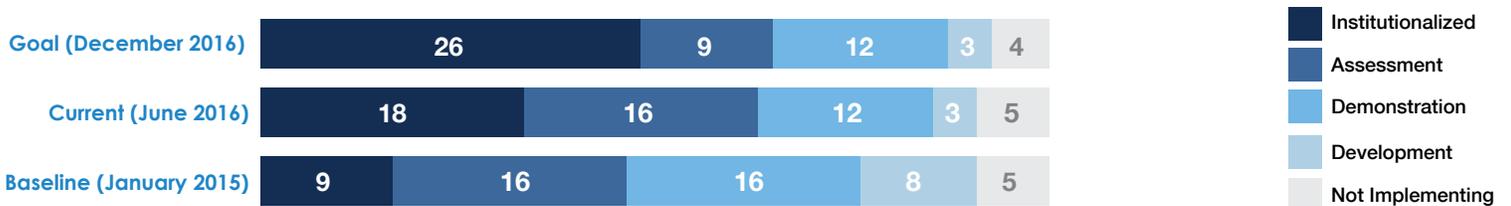
A **road diet** is a low-cost strategy that reconfigures a roadway cross-section to safely accommodate all users, increase mobility and access, reduce crashes and improve a community's quality of life. During EDC-3, FHWA is encouraging state and local agencies to consider road diets as a safety-focused alternative for mixed-use streets.

A common type of road diet involves converting a four-lane, undivided road to three lanes with two through lanes and a two-way turn lane in the middle. The reclaimed space can be allocated to uses such as bike lanes, pedestrian refuge islands, bus lanes and parking. Research shows that road diets can reduce crashes from 19 to 47 percent.

The use of road diets to enhance safety and mobility has attracted widespread interest across the country. They are a standard practice in 17 states and Washington, D.C. Another 28 states are installing road diets and developing processes for identifying potential sites for roadway reconfiguration.



**Number of States in Various Implementation Stages**



# Highlights: Road Diets (Roadway Reconfiguration)

## Arizona

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In Phoenix, where road diets are institutionalized, the city is conducting public outreach for two new projects on Missouri and Osborn Avenues between 7th Avenue and 7th Street. Displays at public meetings will demonstrate the safety benefit of road diets graphically with aerial photos of the street segments showing the most recent five-year crash history. The city is implementing its Comprehensive Bicycle Master Plan and complete streets ordinance, which rely on road diets to improve safety and add bike and pedestrian facilities.

## Colorado

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The **Colorado** DOT implemented a complete streets approach on several projects, each developed through a community process to address the needs of multiple users and modes. Projects include reducing a one-way corridor from four lanes to three and adding bike lanes in Alamosa, modifying a four-lane road section to two lanes with a center left-turn lane and bike lanes in Del Norte, and changing a four-lane road section to two lanes with a center turn lane and widening sidewalks in Monte Vista. The Colorado DOT worked with the town of Buena Vista on a plan to use gateway medians, pedestrian refuge islands, bike lanes and sidewalks on an upcoming project.

## Connecticut

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The **Connecticut** DOT awarded its first road diet project, which will reduce the number of travel lanes from four to two and add bicycle lanes on U.S. Route 44 between U.S. Route 5 and Mary Street in East Hartford. The purpose of the project is to enhance pedestrian and bicyclist safety. The project area was identified as a road diet candidate after a review of the three-year crash history revealed six crashes involving bicycles and eight involving pedestrians.

Through its Safety Circuit Rider Program, the Connecticut DOT encourages road diets as an improvement on municipal roads. The city of Waterbury plans to install a road diet on Freight Street as part of its Waterbury Active Transportation and Economic Resurgence project, which received a TIGER grant from the U.S. Department of Transportation. The city of New Britain is implementing a streetscaping plan that includes road diets to reduce the number of travel lanes, install wider walkways and create bike lanes.

## Florida

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Road diets are institutionalized in Florida with well-established policies and processes. The **Florida** DOT systematically evaluates potential sites for road diet implementation and has 15 potential road diet projects under review. Since 2014, the agency has approved five road diet projects that are now in the design stage.

## Hawaii

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The city and county of Honolulu completed a project to install a road diet on Kamehameha IV Road. The project transformed the road from two driving lanes in each direction to one lane in each direction, a center turn lane and bike lanes.

# Highlights: Road Diets (Roadway Reconfiguration)

## Idaho

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Eight road diets have been completed in Idaho, three more are in the design stage and a list of potential projects has been compiled. A road diet on Main Street in Victor incorporated reverse angle parking. A project on Main Street in Star included three driving lanes, bike lanes and parking. A road diet on 27th Avenue in Boise incorporated three driving lanes, a bike lane and parking on part of the project. The **Idaho** Transportation Department plans to continue to promote road diets to add high-value improvements at a reasonable cost.

## Louisiana

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The **Louisiana** Department of Transportation and Development, which has institutionalized the use of road diets, created a list of potential sites for road diets on state-owned roads. The agency distributed the list to its districts to use as a guide for considering road diets at the sites.

## Maine

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The **Maine** DOT developed **guidelines** for road diet projects. The agency routinely considers road diets to enhance safety and mobility based on site analysis.

## Michigan

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The **Michigan** DOT developed a **checklist** for road diet projects to assure smooth administrative procedures and established a crash reduction factor for use in justifying Highway Safety Improvement Program funding for road diet projects. The agency has used road diets totaling 54.1 miles on 60 state corridors and 88.3 miles on 94 local corridors.

## Nebraska

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The **Nebraska** Department of Roads has three road diet projects in development, two in Omaha and one in Grand Island. The department is considering other potential locations for road diets. The department is partnering with the University of Nebraska at Lincoln on a research project to develop road diet guidelines for communities with fewer than 12,000 residents.

## New Jersey

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The **New Jersey** DOT promotes road diets to address high pedestrian crash rates in the state. The agency created a **video** depicting the benefits of road diets that can be used early in a project to garner local support. It created a checklist to use when analyzing a highway segment to determine the feasibility of implementing a road diet. Installation of road diets is a recommended strategy in the State Strategic Highway Safety Plan and Pedestrian Safety Action Plan.

The New Jersey DOT is collaborating with metropolitan planning organizations to identify potential projects on local and county roads. Thirty-three road diets have been installed on local and county roads in the state, three are under construction and 10 are in the design and planning stages.

## New Mexico

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The **New Mexico** DOT is developing a guidance document that outlines a process for identifying road diet candidates. A road diet project on New Mexico 124 in Laguna is in the design stage, and a project on Boardman Road in Gallup is moving to the bidding phase. Road diets are being explored in Albuquerque and Santa Fe to reduce traffic speeds and crash rates and enhance pedestrian safety.

## Puerto Rico

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The **Puerto Rico** Highways and Transportation Authority is evaluating the road diet concept as it develops a Pedestrian and Cyclist Action Plan and Complete Streets Development Plan. The agency has met with stakeholders such as bicycling organizations to learn about corridors that could be impacted by the road diet technique or other safety measures.

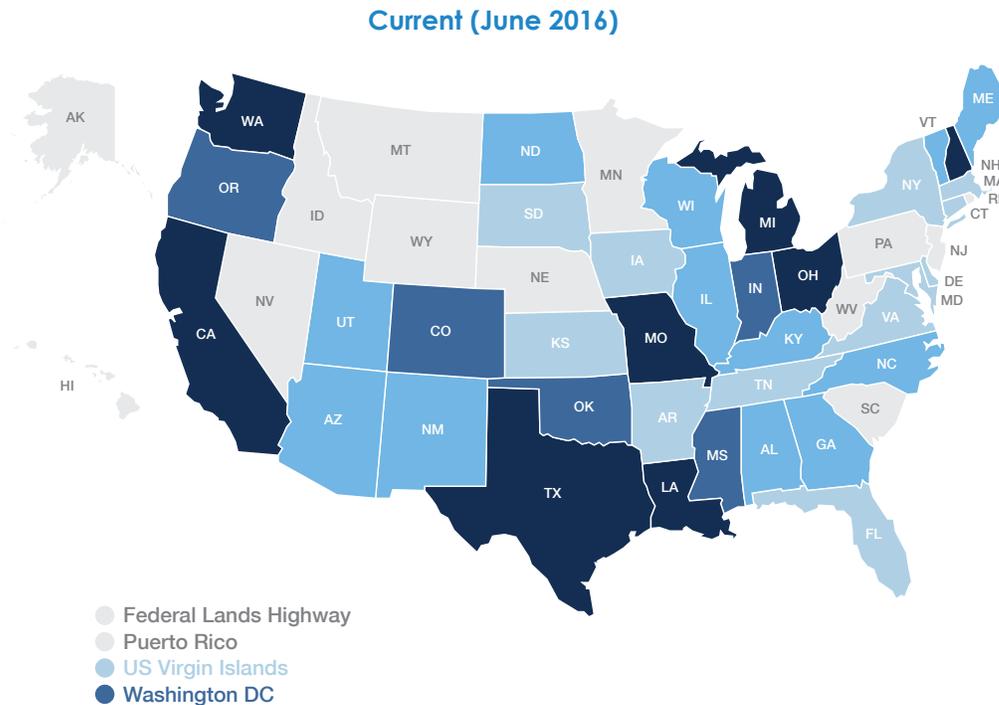
# Smarter Work Zones

The EDC-3 effort on **smarter work zones** encourages the adoption of two efficient work zone strategies: project coordination and technology applications. Project coordination involves construction planning that minimizes the impact of work zones and generates time and cost savings. Cities and regions are combining multiple projects in an area, correlating right-of-way acquisition and utility work, and coordinating work among agencies.

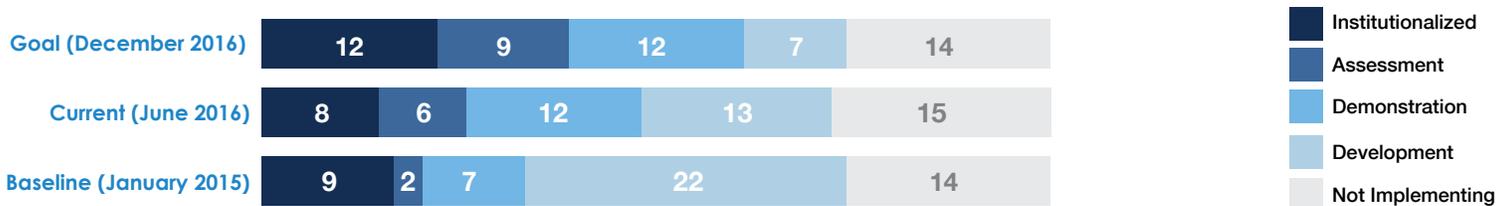
Technology applications such as queue management and speed management involve using intelligent transportation systems to manage work zone traffic. Queue management systems alert drivers to work zone backups so they can slow down safely. Speed management solutions, such as variable speed limit signs, manage work zone traffic in real time.

## Project Coordination

Seventeen states and Washington, D.C., have incorporated project coordination strategies or work zone software tools into planning, design, operating and maintenance processes. Eight states have made it a standard practice to use project coordination to reduce work zone impacts.

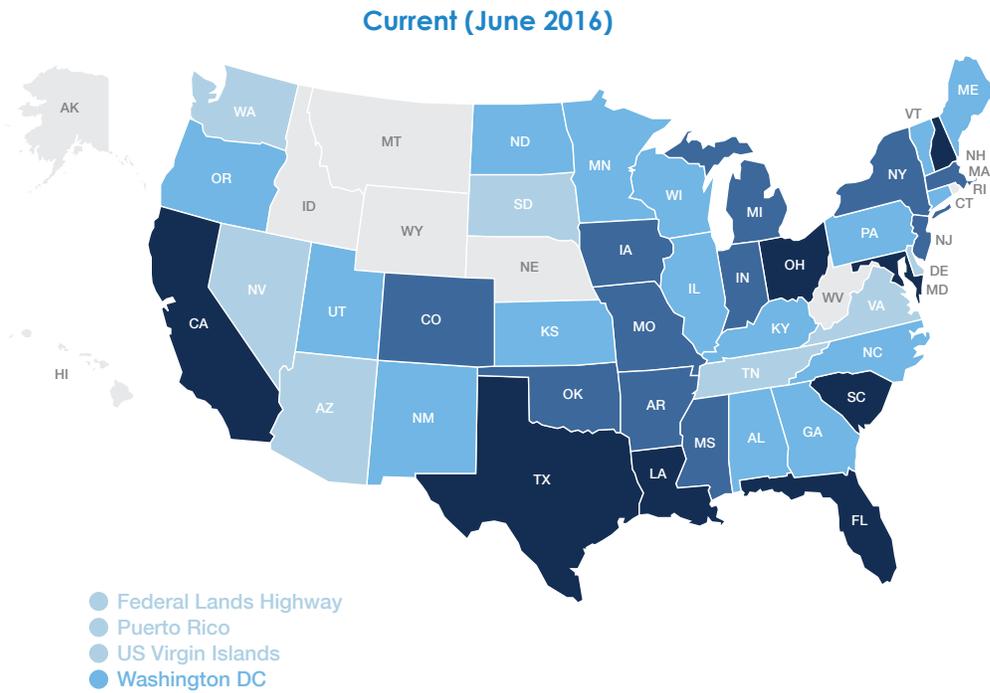


**Number of States in Various Implementation Stages**

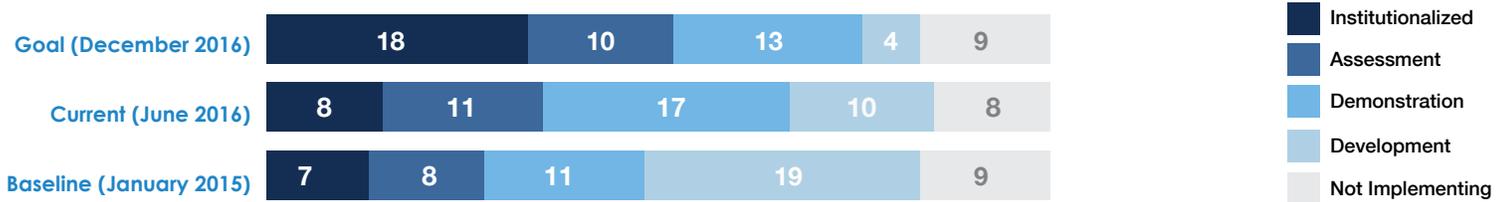


# Technology Applications

Twenty-seven states and Washington, D.C., are incorporating technology applications into work zone planning, design, operating and maintenance practices. Eight states have made using technology tools and strategies to manage work zone impacts a mainstream practice.



**Number of States in Various Implementation Stages**



# Highlights: Smarter Work Zones

## Alabama

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The **Alabama** DOT completed its Guidelines for Operations for project coordination and began incorporating project coordination into a revision of its Guidelines for Developing Construction Plans. The agency received STIC Incentive program funds to implement smarter work zone technologies on pilot construction projects. It conducted a scan tour to learn about successful work zone technologies used in other states and is working with a university partner to identify the most appropriate technologies to deploy in Alabama.

## Arkansas

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The **Arkansas** State Highway and Transportation Department is developing a Statewide Automated Work Zone Information System program for detecting traffic queues and providing public information. The agency plans to start using the program in 2016 to reduce work zone crashes. The program will post work zone information on the **IDrive Arkansas** website. Data collected for the project will be used to develop maximum queue guidance and validate queue analysis on future projects.

## Colorado

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The **Colorado** DOT formed four Work Zone Safety Task Force groups to address performance measurement, training, project coordination and work zone credibility issues. The goal of the groups is to elevate current best management practices and add any needed elements.

## Delaware

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The **Delaware** DOT deployed and is testing a queue detection system on the I-95/State Route 141 ramp project. The system includes five roadside detectors to monitor queues on I-95 northbound and 10 programmable variable message signs. The signs will display messages informing motorists of slowed or stopped traffic ahead and advising them to use alternate routes, which will be displayed on static route signs.

## Iowa

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The **Iowa** DOT continued its collaboration with the Tennessee DOT, Missouri DOT and Memphis Metropolitan Planning Organization on a SHRP2-funded project to expand the uses of Work Zone Impacts and Strategies Estimator, or WISE, software. The Iowa DOT is implementing a Traffic Critical Projects initiative to deploy intelligent work zones where appropriate.

The Iowa DOT used feedback trailers for the first time in intelligent work zones. It is also using a web-based tracking tool to monitor intelligent work zone performance in real time. The agency is in its third year of implementing intelligent work zones through a statewide contract that integrates intelligent work zone equipment with the state Traffic Management Center and Advanced Traffic Management System software to provide consistency and reliability.

# Highlights: Smarter Work Zones

## Maryland

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The **Maryland** State Highway Administration encourages project engineers to use the Work Zone Performance Management application. The tool includes access to the performance management dashboard, real-time status of work zones across the state, weather information, and current and historical traffic speeds. The tool can also be used to determine lane closure costs on projects using lane rental contracts and the best times for lane closures.

## Massachusetts

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The **Massachusetts** DOT is reviewing results of a survey on how to improve communication of project schedules among state and local stakeholders. The agency is working on a solution to track project development from initiation to the construction phase. It has determined that the best way to achieve statewide project coordination is through the existing geographic information system.

The Massachusetts DOT finalized documents defining business practices for designing and deploying portable ITS in work zones. The documents include a work zone ITS matrix, real-time traffic monitoring design standards, scoring criteria for feasibility of work zone ITS and smart work zone standard operating procedures.

## Missouri

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The **Missouri** DOT implemented a dynamic lane merge system on its project to repair the I-70 bridges over the Lamine River near Boonville. The system encourages motorists to adopt the zipper merge technique of using both traffic lanes until they reach the point where a lane is closed, then taking turns to ease safely into the remaining lane. The agency developed an educational **website** to encourage drivers to “merge like a zipper” at work zones.

## Vermont

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The **Vermont** Agency of Transportation developed several mechanisms to assist with work zone project coordination. They include traffic management plan templates, guidance on rolling roadblocks and temporary use of radar speed feedback signs, and use of the **VTransparency** information portal as a project planning map. The agency has an online shared review process that provides a central location for project review comments by multiple stakeholders.

The Vermont Agency of Transportation incorporated queue warning and wireless technologies into three large projects. The primary use of the systems is to address traffic queueing and delays. Cameras are also used to monitor traffic and construction activities.

## Wisconsin

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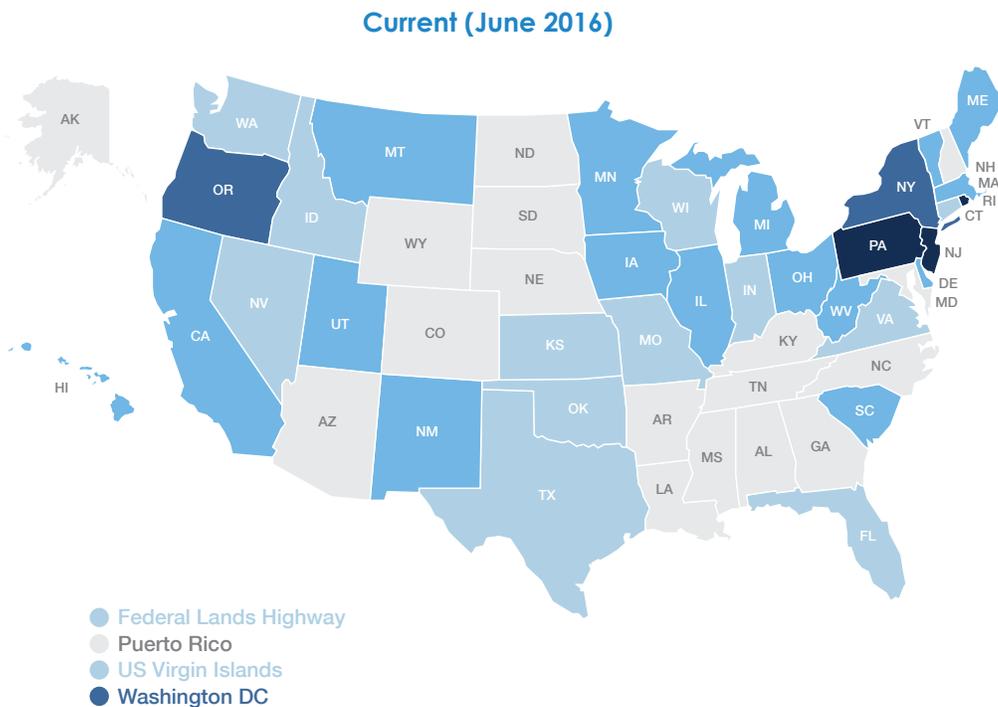
The **Wisconsin** DOT is developing a queue warning decision support tool that will use criteria such as annual average daily traffic, delay and queuing information, and roadway geometry to identify projects on which to deploy queue warning systems. A map associated with the tool will show critical projects, which has the potential to enhance project coordination.

# Ultra-High Performance Concrete Connections for Prefabricated Bridge Elements

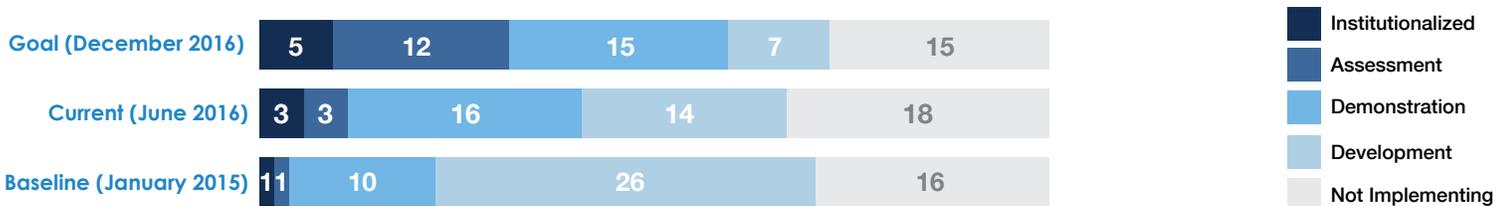
**Ultra-high performance concrete (UHPC)** is a steel fiber-reinforced material that improves durability and simplifies connection details, fabrication and construction when using prefabricated bridge elements. The availability of UHPC is expected to increase the routine use of prefabricated bridge elements to accelerate bridge construction.

The EDC-3 effort focuses on demonstrating the advantages UHPC offers as an option for connecting prefabricated bridge elements. Field casting of UHPC connections between prefabricated components results in a strong connection that provides better long-term performance. The mechanical properties of UHPC allow for the redesign of common connection details in ways that promote both ease and speed of construction.

Eighteen states and Washington, D.C., are using UHPC connections on bridge construction projects or making plans to institutionalize use of the technology. Three states have made UHPC connections a standard practice on bridge projects that use prefabricated elements.



**Number of States in Various Implementation Stages**



# Highlights: Ultra-High Performance Concrete Connections

## California

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The **California** DOT identified two multispan structures for accelerated bridge construction pilot projects using UHPC to connect precast columns to precast bent caps. The projects, scheduled for 2017 construction, will help the agency develop effective design details and guidance to quickly and uniformly implement accelerated bridge construction while mitigating project risk.

## Delaware

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The **Delaware** DOT is using UHPC to connect precast beams on a project to build a bridge over a salt water conveyance channel in the Prime Hook National Wildlife Refuge. The agency will use UHPC to connect precast bridge deck panels on a project on I-95 over Route 7 in 2016 and one on Route 141 over U.S. 13 in 2017.

## Federal Lands Highway

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**Federal Lands Highway** plans to use UHPC closure pours on precast deck panels on the Arlington Memorial Bridge project in Washington, D.C., in 2018. Use of UHPC for deck panel closure pours is also planned for two Yellowstone National Park projects, the Yellowstone River Bridge in 2021 and the Lewis River Bridge in 2022.

## Idaho

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The **Idaho** Transportation Department is scoping three bridge replacement projects for 2017 that will incorporate UHPC. On two projects, UHPC will be used to make connections between deck bulb-tee girders, which will facilitate accelerated construction of prefabricated bridge elements. The third project will use UHPC to make connections between precast elements.

## Illinois

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The **Illinois** DOT is in the plan development stage on its second bridge project with a full-depth deck panel using UHPC. The project will be constructed on a local road over I-57 in southern Illinois. Another project is under design that would use UHPC for the shear keys of an adjacent box beam structure in Northbrook.

## Iowa

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The **Iowa** DOT is using a federal research grant to study the constructability and near-term performance of a UHPC overlay applied on a deteriorated bridge deck. The UHPC overlay was installed on a bridge on County Road L in Buchanan County, the first time a UHPC overlay has been deployed on a deteriorated bridge deck in the United States. The Iowa DOT, which has used UHPC connections on several bridge projects, is developing standards for bridges with adjacent concrete box girders with UHPC joints.

# Highlights: Ultra-High Performance Concrete Connections

## Maine

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The **Maine** DOT is using full-depth precast concrete deck panels with UHPC connections on a project to replace the Western Avenue Bridge in Fairfield. During construction, the agency is working with the contractor and panel fabricator to gather information on the project. It will incorporate experience gained on the project in its development of standard designs, details and specifications for full-depth precast deck panels with UHPC connections.

## Massachusetts

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The **Massachusetts** DOT plans to use UHPC closure pours on two bridge projects: Route 85 over the Assabet River in Hudson and Rochester Road over the Weweantic River in Carver-Middleborough. The agency is developing UHPC standard details for inclusion in its Bridge Manual.

## Michigan

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The **Michigan** DOT planned to use a nonproprietary UHPC mixture for constructing parts of a structure carrying U.S. 23 over the Little Black River near Cheboygan. The agency identified problems with the mixture during trial batch demonstrations that required it to shift to a proprietary UHPC mixture to complete the project. The Michigan DOT plans to conduct additional research on developing a nonproprietary UHPC mixture that can be produced with readily available materials and identify candidate bridges for this technology.

## Minnesota

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Hennepin County is using UHPC on a project to renovate the Franklin Avenue Bridge, a historic concrete arch bridge spanning the Mississippi River in Minneapolis. The project will incorporate UHPC in joints between full-depth concrete deck panels.

## Montana

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The **Montana** DOT completed an accelerated bridge construction project using UHPC for grout pockets, closure pours and joints on a precast concrete deck system. The project replaced a bridge over BNSF Railroad near Windham. The agency is conducting a research project on "Feasibility of Nonproprietary UHPC for Use in Highway Bridges in Montana."

## Vermont

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The **Vermont** Agency of Transportation is using UHPC for the first time on a bridge project in Waitsfield. A second project, now at the design stage, is planned for 2017 construction in Ludlow as part of the agency's Accelerated Bridge Program. It will use UHPC for closure pours between precast bridge elements.









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