

# Every Day Counts:

## An Innovation Partnership With States

***EDC-4 Progress Report #2***  
July–December 2017

# Foreword



Every Day Counts (EDC) is a Federal Highway Administration program 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 December 2017 status of innovation deployment for the 11 innovations in the fourth round of EDC. The report is intended to be a resource for transportation stakeholders as they implement their innovation deployment plans and to encourage ongoing innovation in managing highway project delivery to better serve the Nation.

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“We are grateful as a state for the opportunity EDC 4 has afforded us to share innovative practices and also to learn from others.”

*T. Patrick Cowley, PE  
Innovations and Implementation Manager  
Utah Department of Transportation*

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# Every Day Counts: An Innovation Partnership With States

**Every Day Counts** (EDC) is a Federal Highway Administration program that works 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 deploying proven innovations that facilitate greater efficiency at the State and local levels. Designed to complement other initiatives promoting innovative technologies and practices, 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 2 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. **EDC round four** (EDC-4), which promotes the adoption of 11 innovations in 2017 and 2018, builds on the success of previous deployment efforts.

After the process of selecting EDC innovations for each 2-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 transportation programs. After the summits, **State Transportation Innovation Councils** (STICs), which bring together public and private stakeholders, meet to evaluate innovations and spearhead their deployment. STICs are active in all 50 States, Washington, DC, Puerto Rico, the U.S. Virgin Islands, and Federal Lands Highway.

*View the "Mission Possible" video for a quick look at the 11 EDC-4 innovations.*

EDC's collaborative, State-based approach to deploying innovation enables States to determine which innovations will work best for them and their customers. Working through STICs, States can consider EDC innovations along with other recommendations from sources such as the AASHTO **Innovation Initiative** and the **second Strategic Highway Research Program** and adopt those that add value to their transportation programs.

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 multiagency 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.

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"We're collaborating with transportation stakeholders to mainstream innovations that enable State and local agencies to do more with less and stretch taxpayer dollars."

*Brandye Hendrickson, FHWA Acting Administrator*

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FHWA also offers assistance through its **STIC Incentive** and **Accelerated Innovation Deployment (AID) Demonstration** programs to encourage and provide incentives for innovation deployment. The STIC Incentive program provides up to \$100,000 a year per State to help STICs make innovations standard practice. The AID Demonstration program provides an incentive of up to \$1 million to support the cost of deploying an innovation in any phase of a highway project. The program allocates up to \$10 million a year in incentive funds.

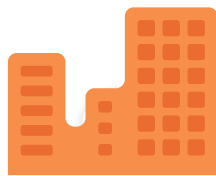
The EDC program has had a significant positive impact on the transportation community's adoption of new technologies and processes. Since the program began, every State transportation agency has used 14 or more of the 43 EDC innovations, and some have adopted more than 30. Many of these innovations are now mainstream practices across the country. The 2015 **Fixing America's Surface Transportation Act** included EDC by name, directing FHWA to continue fostering a culture of innovation with stakeholders to deploy innovative practices and technologies.

View the "Power of the STIC" video series to learn how the **national STIC network, local agencies, State transportation departments, academia, and industry** collaborate to accelerate innovation deployment.

**STIC Overview**



**Local Public Agencies**



**DOTs**



**Academia**



**Industry**



See the **State Innovation Accomplishments map** for details on **AID Demonstration** and **STIC Incentive** projects, innovation deployment examples from articles and reports, and STIC network contacts.



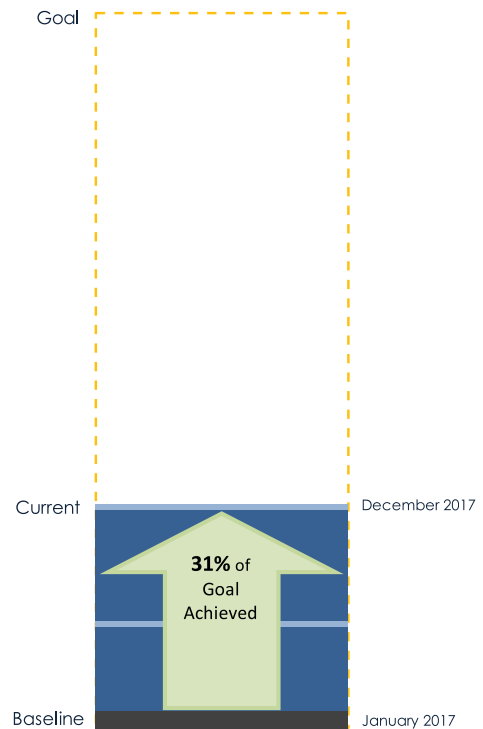
# EDC-4 Innovation Implementation

Every 6 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-4 and includes maps and charts that show the progress made in advancing the technologies and practices by the end of December 2017.

The maps illustrate the innovation implementation stage in each State. The charts show the number of States that have demonstrated, assessed, or institutionalized the innovation. The charts also compare the December 2017 state of practice to the January 2017 baseline data and December 2018 goals set by States.

“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, DC, Puerto Rico, the U.S. Virgin Islands, and Federal Lands Highway (FLH), a total of 54 entities.

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



Attainment of Demonstration, Assessment, or Institutionalized Implementation Across All Innovations and States  
Progress Report #2

## Innovation Implementation Stages

|                            |   |
|----------------------------|---|
| <b>Not Implementing</b>    | The State is not using the innovation anywhere in the State and is not interested in 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.                                       |



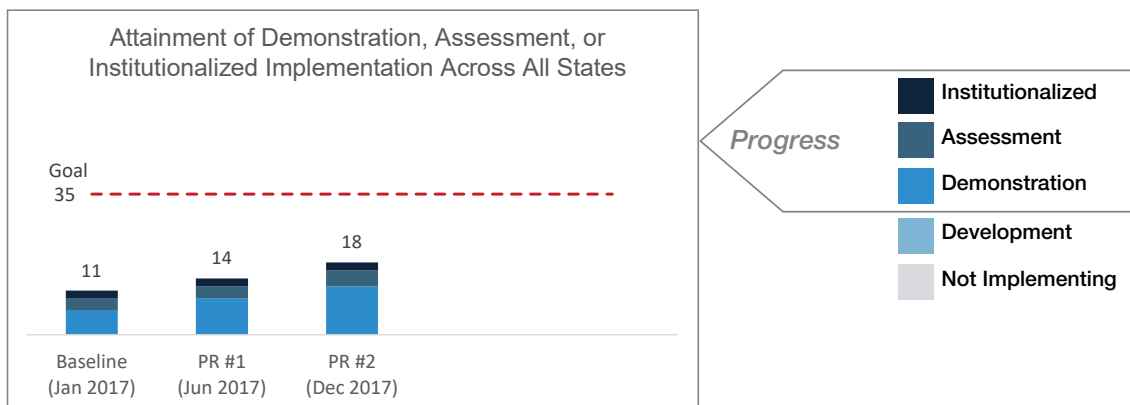
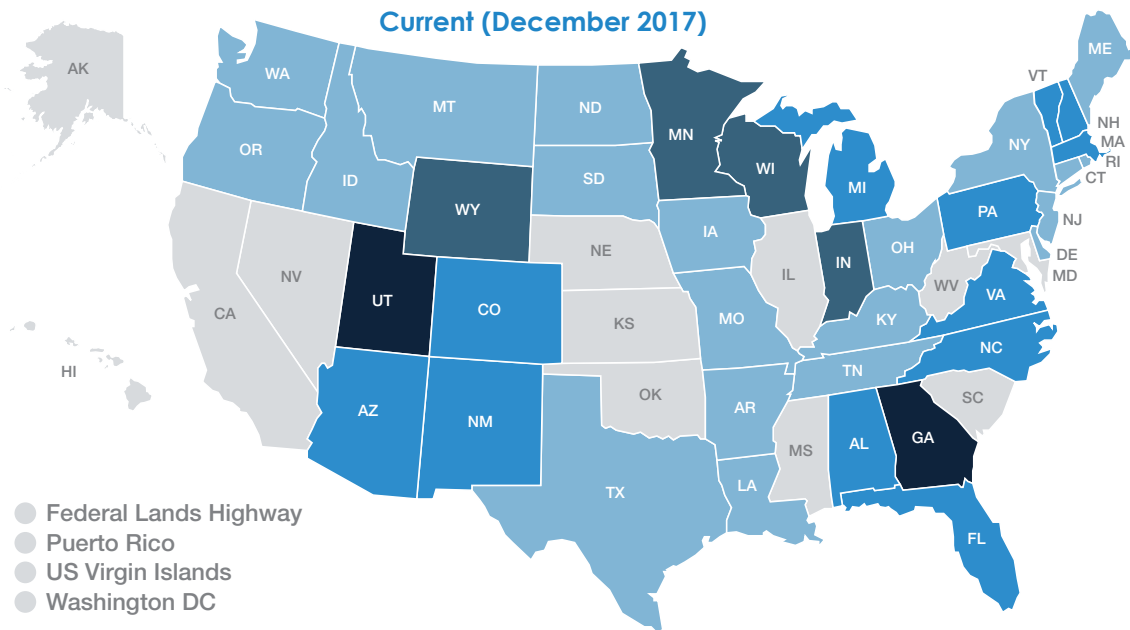
# Automated Traffic Signal Performance Measures

**Automated traffic signal performance measures** (ATSPMs) enable transportation agencies to incorporate objectives and performance-based approaches in traffic signal operations, maintenance, design, and management. Using ATSPMs can improve safety and customer service while cutting congestion and costs.

More than 330,000 traffic signals operate in the United States. Typically, agencies retime signals on a 3- to 5-year cycle at a cost of about \$4,500 per intersection. For most signals, citizen complaints are the primary performance measure. The need to use software modeling to simulate performance and manually collected traffic data drives up retiming costs.

ATSPMs consist of a high-resolution data-logging capability added to existing traffic signal infrastructure and data analysis techniques. This cost-effective technology provides the information needed to manage traffic signal maintenance and operations in support of an agency's safety and mobility goals.

Using ATSPMs to enhance safety and customer service is generating interest across the country. Twenty States are developing implementation plans and learning more about this innovation. Sixteen States are demonstrating and assessing the technology. Two States have made ATSPMs a standard practice.



## Automated Traffic Signal Performance Measures

The **Alabama** Department of Transportation, city of Tuscaloosa, University of Alabama, and FHWA are partnering to deploy ATSPMs at 85 intersections in the Tuscaloosa area. The project includes installation of 85 dedicated short-range communication (DSRC) radios on State Routes 69 and 215 and U.S. Routes 82 and 11. The goal is for the DSRC radios to enrich the dataset for signal performance and establish a foundation for future connected autonomous vehicle testing.

The **Colorado** Department of Transportation (CDOT) implemented ATSPMs on about 50 traffic signals on six State arterial corridors in the Denver area. CDOT is updating infrastructure at 100 additional signal locations to collect and analyze high-resolution data logs from signal controllers and create evaluation reports to determine the benefits. CDOT reports improvement in response timelines and time and cost savings by proactively addressing signal operation and maintenance issues. Signal complaints on optimized corridors decreased by as much as 30 percent.

The **Montana** Department of Transportation (MDT) developed a draft concept of operations document for its statewide traffic signal system. The proposed system combines existing local and central traffic signal software with deployment of an ATSPMs system. MDT will conduct a pilot project to test the concept of operations and its ability to collect and use data to maintain the signal system efficiently.

The **Virginia** Department of Transportation (VDOT) is demonstrating ATSPMs at about 25 intersections in the agency's Northwest Region. VDOT is tracking five performance metrics at the intersections, such as traffic volume counts and platoon progression, in which a platoon of vehicles leaving one intersection arrives at the next while the traffic light is green. VDOT set up the performance metrics using freeware developed by the Utah Department of Transportation (UDOT).



*ATSPMs make it possible to preserve the best possible traffic signal operation, rather than replacing noticeably failing operation at infrequent intervals.*



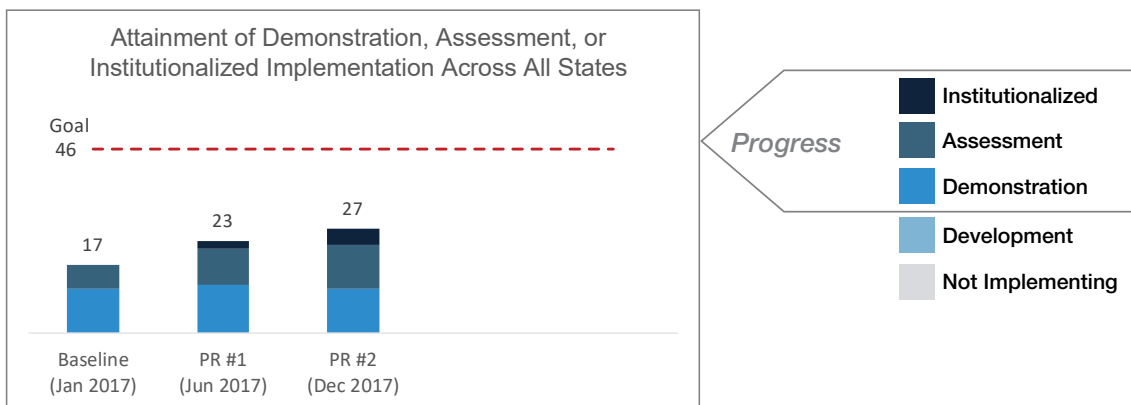
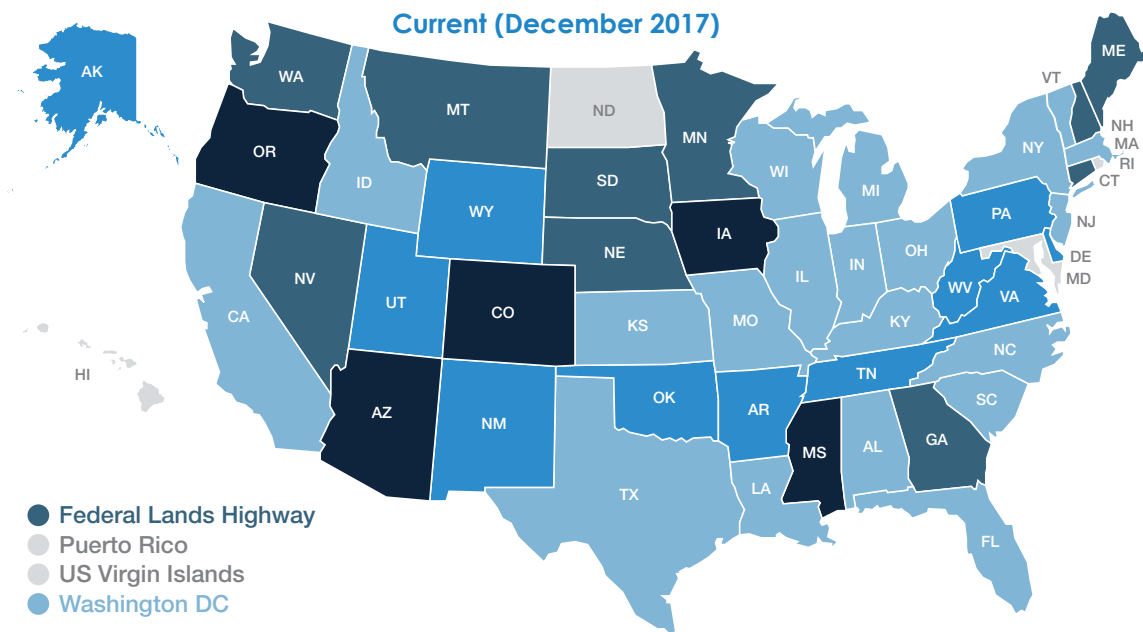
# Collaborative Hydraulics: Advancing to the Next Generation of Engineering (CHANGE)

The effort on **collaborative hydraulics: advancing to the next generation of engineering** (CHANGE) uses hydraulic tools to improve understanding of complex interactions between river or coastal environments and transportation assets, enabling better design and more efficient project delivery.

The next generation of hydraulic engineering tools provides planners and designers with data they can use to improve project quality. The technology can be used to illustrate patterns of flow discharge, water surface elevations, depth, velocity, and shear stress. The results allow for more accuracy in estimating flow conditions and paths, evaluating hydraulic considerations, and assessing extreme weather event scenarios.

These new hydraulic modeling tools represent a significant evolution in hydraulic modeling theory and practice, with potential for streamlining environmental, regulatory, engineering, and other aspects of project delivery. The results can improve the ability of highway agencies to design safer, more cost-effective, and resilient structures on waterways.

CHANGE is generating widespread interest among States. Twenty-one States and Washington, DC, are developing implementation plans and learning more about this innovation. Twenty-one States and FLH are demonstrating and assessing hydraulic engineering tools. Five States have institutionalized hydraulic tools.



## *Collaborative Hydraulics: Advancing to the Next Generation of Engineering (CHANGE)*

The **Arizona** Department of Transportation (ADOT) is taking steps to institutionalize two-dimensional (2D) hydraulic modeling. After using 2D hydraulic modeling on several projects, ADOT convened a peer exchange with agency staff and local and Federal partners to discuss development of 2D hydraulic modeling user guidance. Twenty-five ADOT staff members and partners are pursuing National Highway Institute training on 2D hydraulic modeling.

The **Nevada** Department of Transportation (NDOT) is applying 2D hydraulic modeling technology to multiple projects. NDOT is also using unmanned aerial mapping technology to develop terrain data to support its 2D hydraulic modeling. NDOT presented details on its use of drones to collect data for 2D hydraulic modeling during a March 2018 webinar.

**FLH**, which uses 2D hydraulic modeling for all new analyses in river and coastal environments, is applying the technology on several bridge projects for the National Park Service, U.S. Forest Service, and county agencies. The 2D modeling software allows FLH to create better representations of the interactions between transportation assets and river and coastal environments. FLH is using 2D modeling on projects involving single and multiple span bridges, bank stabilization, floodplain analysis, root wad debris, and multiple stream confluences.

The **Georgia** Department of Transportation (GDOT), which used 2D modeling on four in-house projects, made the use of 2D modeling mandatory on projects where water flow passes through multiple bridge openings and supports its use for other appropriate modeling situations. GDOT finds that 2D modeling provides more accurate water surface elevations and distribution of flows through multiple openings.



*The latest 2D hydraulic modeling tools offer better representations that provide planning and design teams with better data, leading to improved project quality.*

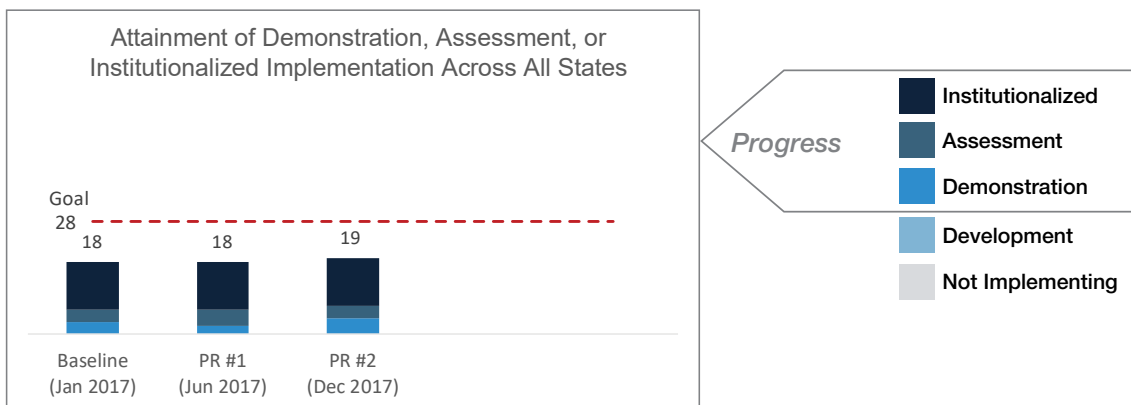
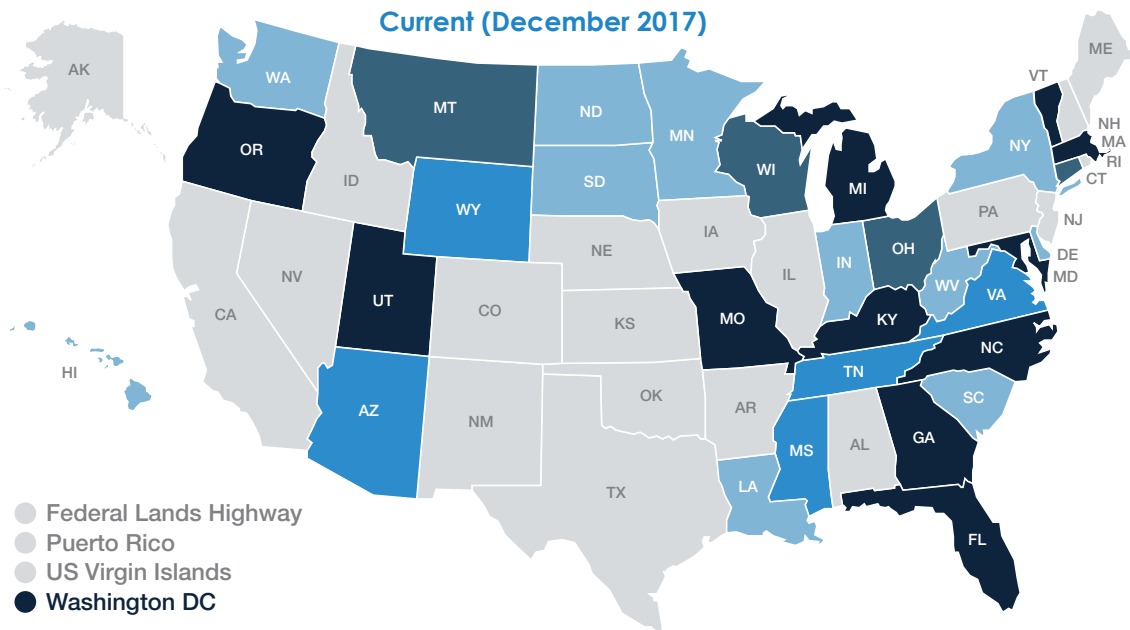
# Community Connections

**Community connections** are performance management approaches for planning, designing, and building transportation projects that promote connectivity, revitalize communities, and improve public health and safety.

Transportation can play an important role in supporting community revitalization. Using performance-based management approaches can help transportation agencies develop highway retrofitting, rehabilitation, or removal options that turn aging infrastructure into opportunities for reestablishing community connections and cohesion.

Strategies planners and designers can use to connect communities and retrofit transportation infrastructure include visualization tools, scenario planning techniques, public involvement techniques, context-sensitive solutions, and design and construction processes. The community connections framework and tools can help agencies identify gaps and work to ensure that all users have access to safe, reliable, affordable, and multimodal transportation networks.

Thirteen States are developing implementation plans and learning more about community connections. Seven States are demonstrating and assessing community connections approaches to enhance their transportation networks. Eleven States and Washington, DC, have made community connections a standard practice.





## Community Connections

The **Connecticut** Department of Transportation (CTDOT) plans to implement a Community Connectivity Grant Program to fund targeted infrastructure improvements identified through **road safety audits** or other transportation planning initiatives. The program will enable municipalities to perform small-scale infrastructure improvements that make conditions safer and more accommodating for pedestrians and cyclists, encouraging more people to use these healthy and environmentally sustainable travel modes. In the past year, CTDOT performed 80 road safety audits at locations selected by municipalities.

The **Washington State** Department of Transportation (WSDOT) developed the **U.S. 395 North Spokane Corridor “NSC Place”** online engagement hub. This geographic information system story map is a dynamic tool that enables community members to learn about and contribute to “creating place” in and around the remaining 5-mile segment of the corridor. The site includes information on the project, engagement opportunities, updates, and planning outcomes. It also offers an opportunity to provide online input to WSDOT.

Community connections deployment is underway in several other States. The **Louisiana** Department of Transportation and Development selected I-10 in Baton Rouge for a community connections pilot project and scheduled a spring 2018 peer exchange on deploying this innovation. The **Minnesota** Department of Transportation (MnDOT) established an Office of Community Connections to focus on planning and design techniques, public involvement strategies for reconnection, and operational improvements. The **Ohio** Department of Transportation (ODOT) is developing a policy that will require consideration of the need for community connections on all ODOT transportation projects. The **Tennessee** Department of Transportation (TDOT) is conducting a study for an I-24 interchange project in Chattanooga to reconnect a disadvantaged community to employment, food, and recreation opportunities.



The lid over Interstate 90 on Mercer Island near Seattle, WA, enhances community connections with green space for a public park.

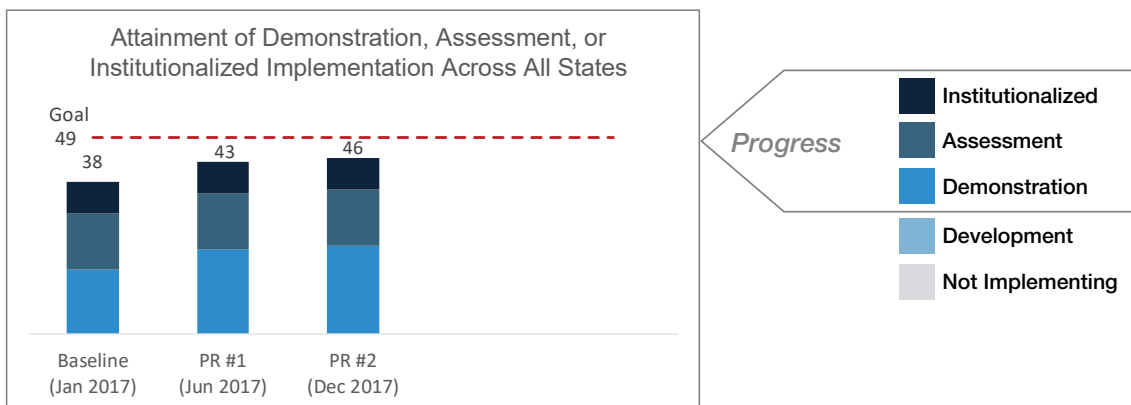
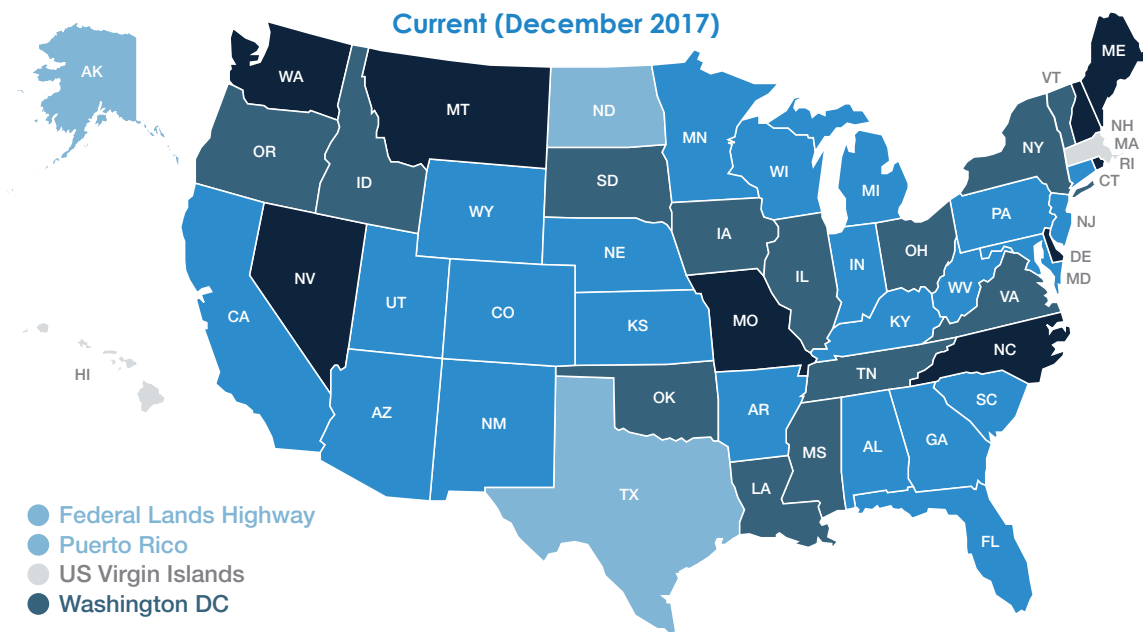
# Data-Driven Safety Analysis

**Data-driven safety analysis** (DDSA) uses tools to analyze crash and roadway data to predict the safety impacts of highway projects, enabling agencies to target investments with more confidence and reduce severe crashes on roads.

Traditional crash and roadway analysis methods rely mostly on subjective or limited quantitative measures of safety performance. DDSA employs new, evidence-based models that provide agencies with the means to quantify safety impacts. In EDC-4, FHWA will continue to help States incorporate DDSA into processes and policies, but a new focus will be on assisting local agencies in gaining proficiency with DDSA tools.

DDSA includes two approaches that agencies can implement individually or in combination. Predictive analysis helps identify roadway sites with the greatest potential for improvement and quantify the expected safety performance of project alternatives. Systemic analysis uses crash and roadway data to identify roadway features that correlate with particular crash types.

Interest in using DDSA to enhance safety and reduce roadway crashes continues to grow. Three States, FLH, and Puerto Rico are developing implementation plans and learning more about this innovation. Thirty-six States and Washington, DC, are demonstrating and assessing DDSA tools to target safety investments. Nine States have made DDSA a standard practice.





## Data-Driven Safety Analysis

The **Alaska** Department of Transportation and Public Facilities (DOT&PF) started a review using the **Model Inventory of Roadway Elements** (MIRE) to identify essential data elements for an Alaska-specific systemic safety process, based on FHWA's **Systemic Safety Project Selection Tool**. MIRE is a list of roadway features and traffic volume elements important to DDSA. The Alaska DOT&PF plans to finalize its data elements list over the next year.

MnDOT is finalizing a performance-based practical design guidance document that emphasizes the use of the AASHTO **Highway Safety Manual** to inform design decisions. **Minnesota** agencies are updating their **County Roadway Safety Plans**, with an emphasis on systemic safety analysis. MnDOT plans to develop Minnesota-specific crash modification factors, which measure the effectiveness of safety countermeasures, to better quantify benefits and costs for **Highway Safety Improvement Program** (HSIP) projects.

For a **design-build** project, the **Missouri** Department of Transportation (MoDOT) used DDSA to identify locations with safety concerns and the types of improvements that would save the most lives. MoDOT received a 2017 National Roadway Safety Award from FHWA and the Roadway Safety Foundation for the project. MoDOT is developing a tool to perform predictive crash analysis. The tool, which uses Highway Safety Manual equations, will help staff perform network screening, safety countermeasure selection, and evaluation.

In **Utah**, UDOT and three counties used the Roadway Safety Foundation's **usRAP** software tool and historical crash data to identify and prioritize HSIP projects. UDOT reports that the usRAP results were particularly helpful for rural roadways with little crash history. UDOT is incorporating the usRAP output into **Statewide Transportation Improvement Program** projects to ensure safety improvements are considered for funding in the planning and scoping phases.



*DDSA provides more reliable analysis than previous methods through the application of predictive and systemic tools for analyzing crash and roadway data.*

# e-Construction and Partnering: A Vision for the Future

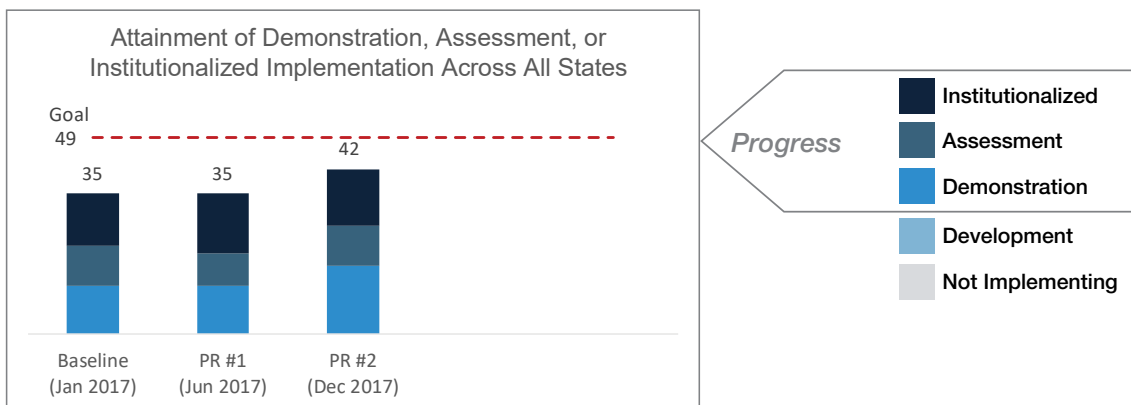
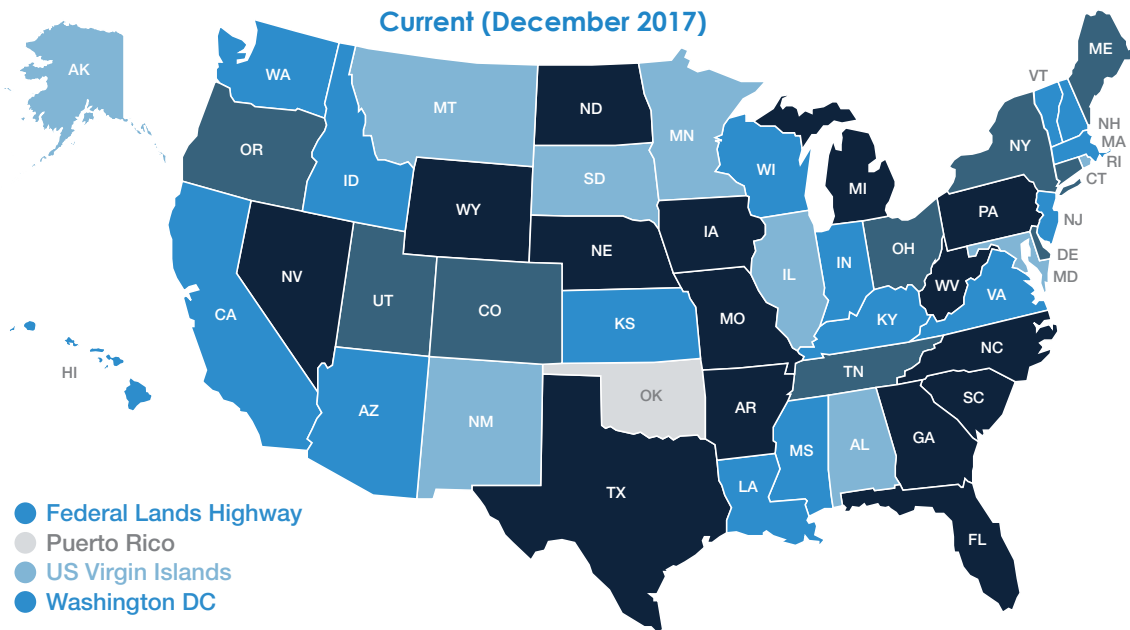
**e-Construction and partnering: a vision for the future** involves using paperless technologies to enhance partnering among stakeholders on construction projects, improving communication and workflows while streamlining project delivery.

e-Construction is the creation, review, approval, distribution, and storage of highway construction documents in a paperless environment. It uses readily available technologies to improve construction document management. It saves time by decreasing the delays inherent in paper-based project administration. It also saves paper, printing, and document storage and transmission costs.

Construction partnering is a project management practice in which transportation agencies, contractors, and other stakeholders create a team relationship of mutual trust and enhanced communication. Partnering builds connections among stakeholders to improve outcomes and complete quality projects that are focused on safety and built on time and within budget.

## e-Construction

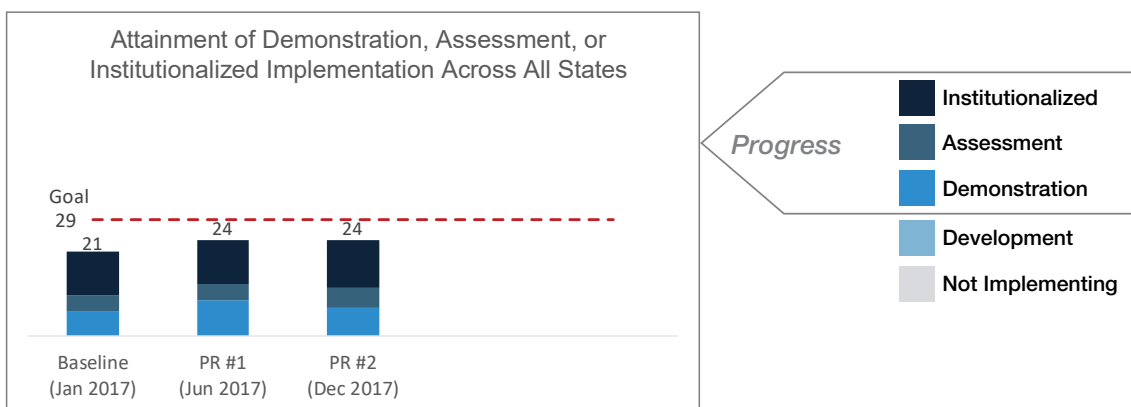
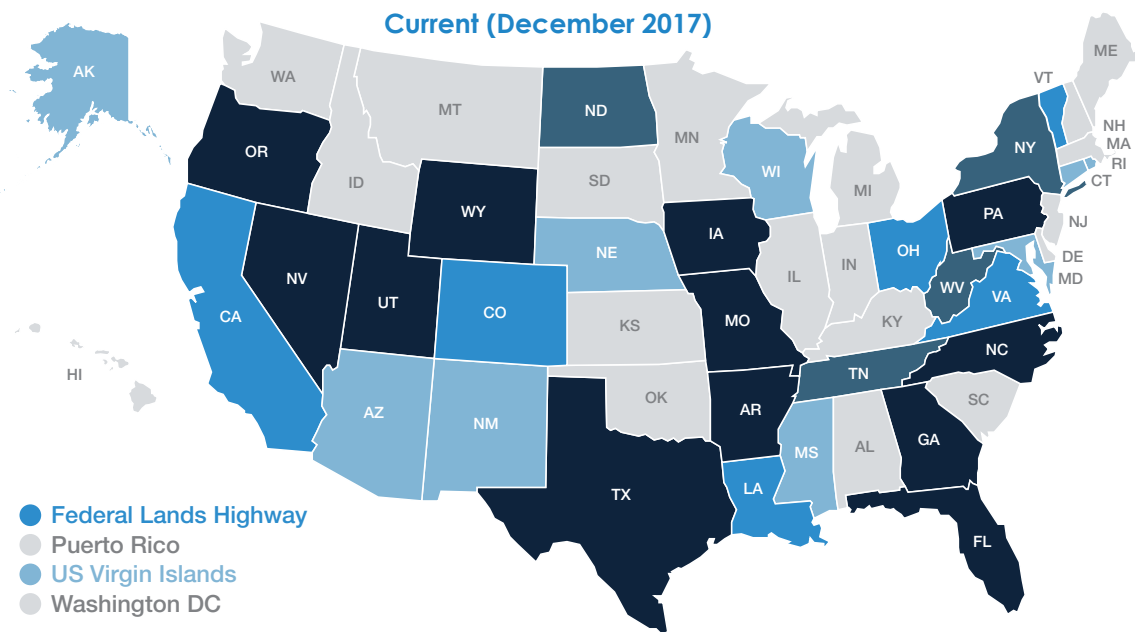
Applying a paperless approach to project document management continues to attract interest. Nine States and the U.S. Virgin Islands are developing implementation plans and learning more about this innovation. Twenty-five States, FLH, and Washington, DC, are demonstrating and assessing e-Construction tools and processes. Fifteen States use e-Construction as a standard practice.





## e-Construction and Partnering

Nine States and the U.S. Virgin Islands are developing implementation plans and learning more about e-Construction and partnering. Eleven States and FLH are demonstrating and assessing paperless technologies to improve partnering among stakeholders on construction projects. Twelve States have made e-Construction and partnering a standard practice in project delivery.





## *e-Construction and Partnering: A Vision for the Future*

The **California** Department of Transportation (Caltrans) is among the agencies that are combining e-Construction and partnering to improve project delivery. Caltrans, which has a formal construction partnering program with a **guidebook** on partnering facilitation, completed a survey in November 2017 on the state of partnering and ways to improve partnering processes. The survey participants included industry project managers and Caltrans resident engineers. Caltrans is evaluating the survey results to determine next steps.

As part of its e-Construction deployment effort, The **Kentucky** Transportation Cabinet launched an all-electronic change order process and is implementing fully electronic funding authorizations. The adoption of e-Construction increased the consistency of the information **Delaware** Department of Transportation (DelDOT) construction inspectors include in their daily reports. Electronic reporting also increased the types of information being tracked, resulting in better descriptions of the work conducted on DelDOT projects.

To enhance its construction partnering effort, the **Pennsylvania** Department of Transportation (PennDOT) joined the International Partnering Institute (IPI). PennDOT formed a working group of agency staff and industry partners to evaluate how to implement partnering strategies. Based on IPI template specifications and several State specifications, the group developed a draft specification using a scalable partnering approach.



*Construction partnering and electronic documentation are two means of connecting stakeholders to improve collaboration and project delivery.*

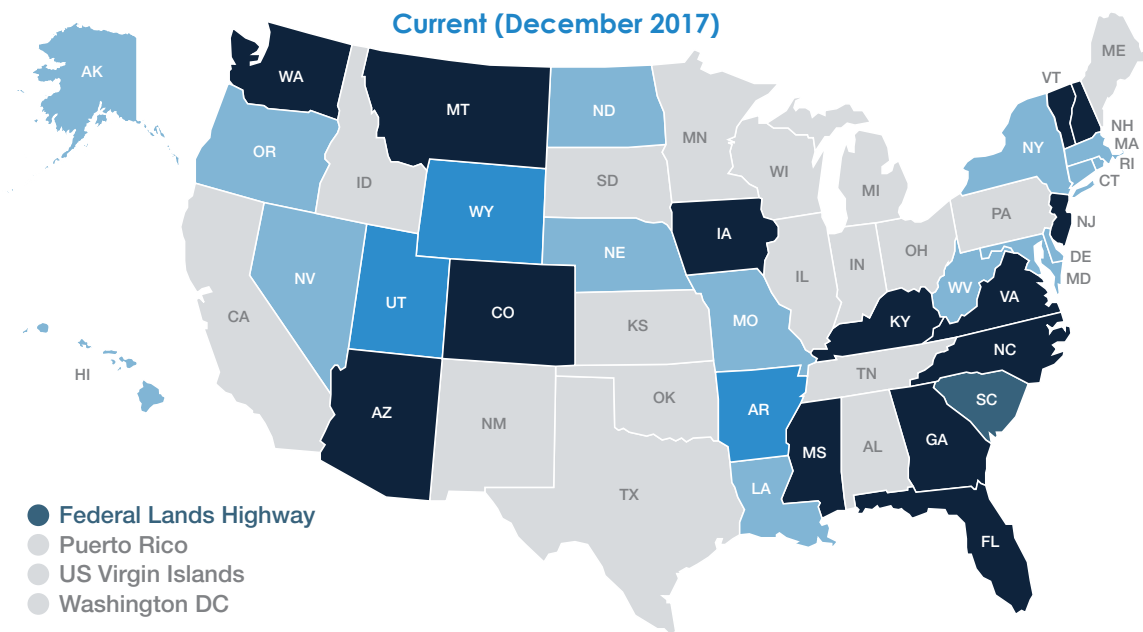
# Integrating National Environmental Policy Act and Permitting

**Integrating National Environmental Policy Act (NEPA) and permitting** processes enables concurrent, synchronized environmental and permitting reviews that save time and reduce costs for the agencies involved.

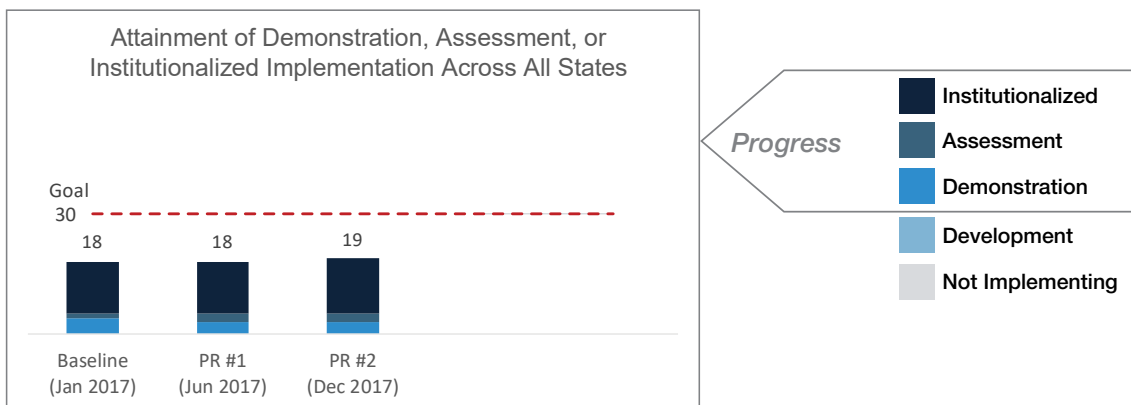
Integrating NEPA and permitting processes allows the various environmental reviews and permitting procedures required for Federal-Aid Highway Program projects to be performed at the same time rather than sequentially. The resulting synchronization provides for more effective and efficient regulatory reviews, leading to projects with reduced impacts on the environment as well as time and money savings.

The EDC-4 effort focuses on outreach, training, and technical assistance to help transportation departments integrate NEPA and permitting processes. The effort features proven best practices, data management, and tools for navigating environmental assessments and environmental impact statements needed for transportation projects. It also offers assistance on using FHWA's online collaboration tool, eNEPA, to support timely and consistent coordination among agencies to complete necessary permitting processes.

Fifteen States are developing implementation plans and learning more about integrating NEPA and permitting. Four States and FLH are demonstrating and assessing tools to integrate NEPA and permitting processes. Fourteen States have made it a standard practice to integrate NEPA and permitting processes on projects.



- Federal Lands Highway
- Puerto Rico
- US Virgin Islands
- Washington DC





## *Integrating National Environmental Policy Act and Permitting*

**FLH** is working with regulators on a project to rehabilitate approximately 12 miles of Sir Francis Drake Boulevard in Point Reyes National Seashore in California. Regular meetings with regulators enabled FLH to identify mitigation opportunities to streamline the review of Clean Water Act (CWA) Sections 404 and 401 applications with the Environmental Protection Agency (EPA) and biological assessments with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). NMFS confirmed that its involvement will help FLH get a biological opinion in 60 days instead of 145 days, the review time allowed by regulation.

In **Georgia**, GDOT, FHWA, the State Historic Preservation Office, and the U.S. Army Corps of Engineers (USACE) are drafting a programmatic agreement to streamline transportation project reviews under Section 106 of the National Historic Preservation Act. The purpose of the agreement is to improve review efficiency and promote consistency.

**South Carolina** stakeholders drafted a National Environmental Policy (NEPA) and CWA Section 404 merger agreement to establish procedures and provide guidance to the South Carolina Department of Transportation, FHWA, and USACE. The merger agreement will ensure that documentation and coordination conducted during the environmental review and permitting processes will meet the standards of all signatory agencies. It will also ensure that any preferred alternative selected under a joint NEPA/CWA Section 404 decision-making process also complies with CWA Section 404 guidelines.

In **Virginia**, VDOT, FHWA, USACE, EPA, and USFWS signed an agreement that simplifies the NEPA and CWA Section 404 merger process. The primary purpose of the agreement is to secure a preliminary “least environmentally damaging practicable alternative” determination from USACE during the NEPA process so the permitting process can progress more smoothly and with minimal delays.



*Employing a project delivery process that integrates environmental reviews and permitting can help achieve effective and efficient delivery of transportation projects.*

# Pavement Preservation (When, Where, and How)

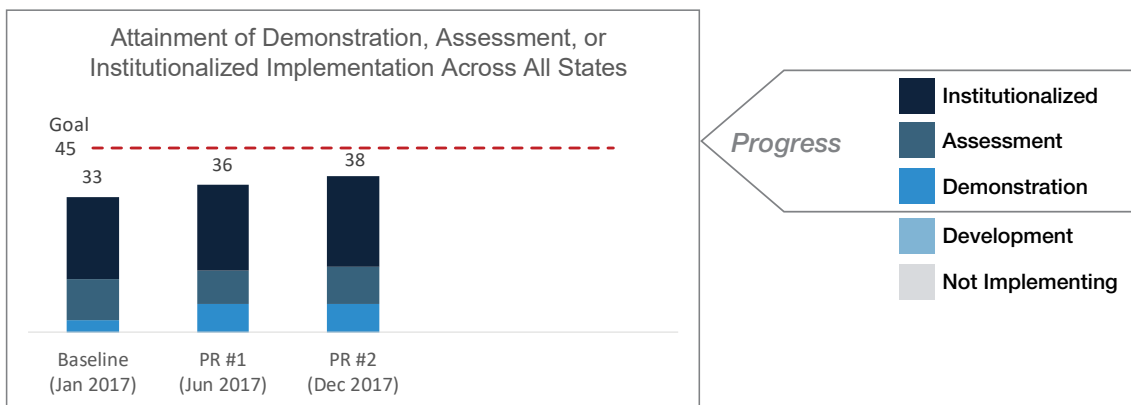
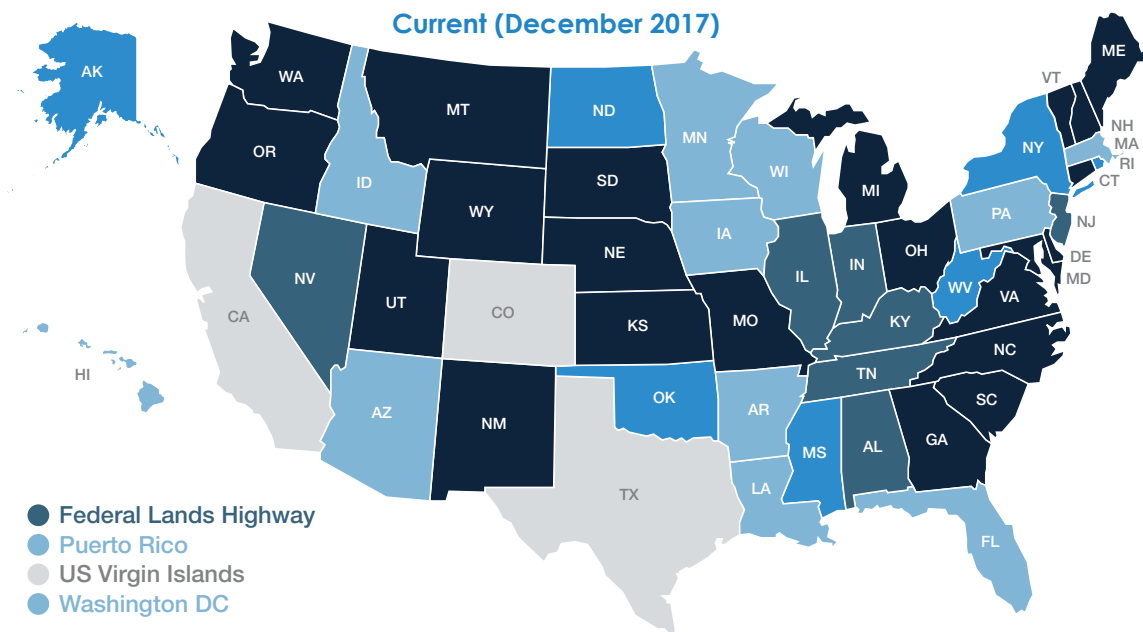
**Pavement preservation (when, where, and how)** involves applying a pavement preservation treatment at the right time on the right project with quality materials and construction, offering a critical investment strategy for optimizing infrastructure performance. Pavement preservation practices provide a cost-effective approach to extending the service life of pavements and achieving smoother, safer roads with fewer costly repairs.

In EDC-4, the “when and where” component of pavement preservation supports preservation of highway investments by managing pavements proactively. Whole-life planning defines expectations for the long term and provides more stability to the cost of operating and maintaining highway pavements. Identifying preservation strategies at the network level reduces the need for frequent or unplanned reconstruction.

The “how” component of pavement preservation promotes quality construction and materials practices, including treatment options that apply to flexible and rigid pavements. Successful construction practices contribute to improved pavement performance, providing smoother, safer roads and delaying the need for rehabilitation.

## Pavement Preservation: When and Where

Eleven States, Puerto Rico, and Washington, DC, are developing implementation plans and learning more about when and where to apply pavement preservation treatments. Fifteen States and FLH are demonstrating and assessing the when and where component of pavement preservation. Twenty-two States have made it a standard practice to manage pavements proactively to preserve highway investments.

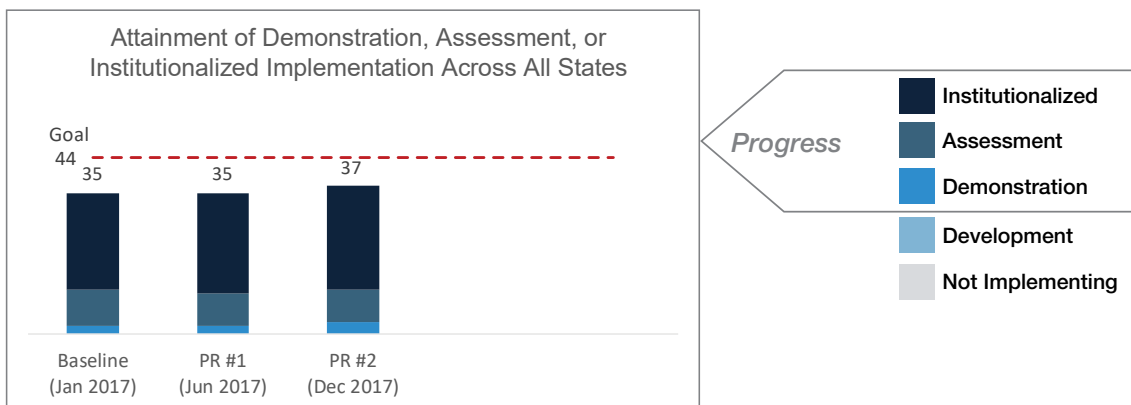
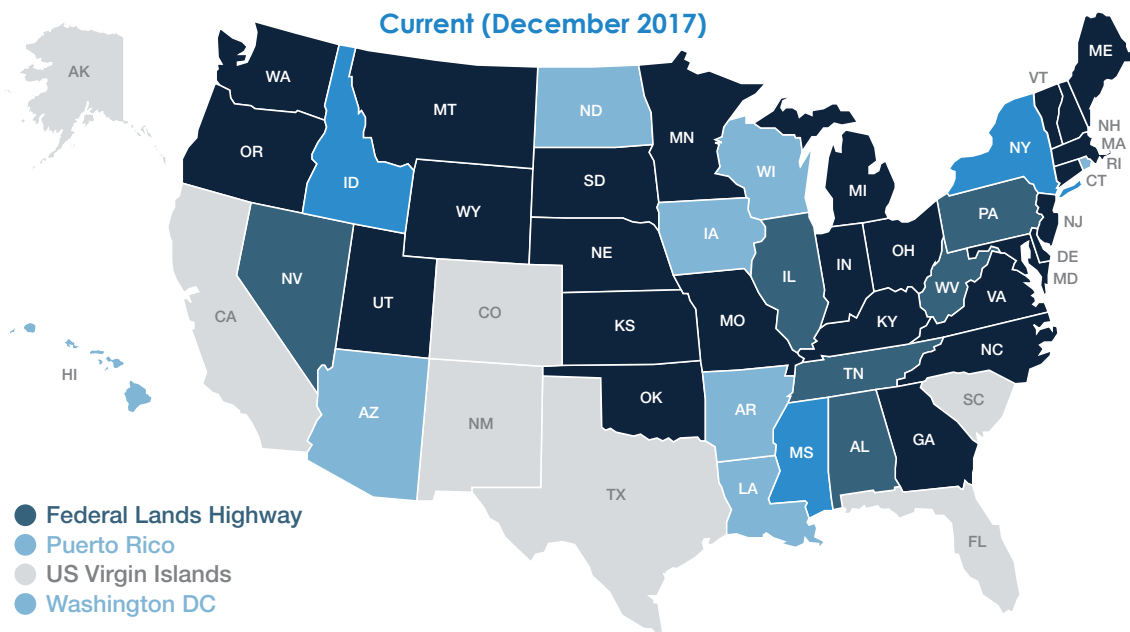






## Pavement Preservation: How

Eight States, Puerto Rico, and Washington, DC, are developing implementation plans and learning more about how to apply pavement preservation treatments. Ten States and FLH are demonstrating and assessing the how component of pavement preservation. Twenty-six States have institutionalized the use of quality construction and materials practices to preserve pavements.



## Pavement Preservation (When, Where, and How)

In **Connecticut**, CTDOT completed seven pavement preservation treatment projects totaling nearly 56 two-lane miles of roadway under its pavement preservation program. CTDOT saved on resources and expedited implementation by combining several projects in a competitive bid contract instead of bidding by project. Using this method enabled CTDOT to complete more projects in a shorter time period.

The **Mississippi** Department of Transportation (MDOT) is evolving its pavement data collection process from statistical sampling with visual assessments to automated collection on all interstates and two- and four-lane routes. A new pavement management system will enable MDOT to better use historical pavement condition data to implement strategies for targeted maintenance and preservation and forecast future conditions. MDOT's process includes the use of decision trees to indicate the timing of and investment in preservation treatments needed to yield the lowest life cycle cost.

The **New Jersey** Department of Transportation (NJDOT) is exploring new pavement preservation treatments, developing specifications for them, monitoring their performance, and institutionalizing them as appropriate. NJDOT plans to construct two ultra-thin bonded wearing course projects using a revised specification and evaluate them for constructability and performance. NJDOT selected several high-performance thin overlay projects that will use an ultra-thin paver. The paver sprays a polymer-modified tack coat in front of the asphalt mixture, eliminating tracking issues associated with standard tack coat application and increasing bonding of the thin overlay to the existing pavement, resulting in superior performance.

The **Puerto Rico** Highway and Transportation Authority (PRHTA) developed a pavement preservation plan, including development of new pavement preservation specifications. The first stage includes supplemental specifications for Marshall, Superpave, and **warm-mix** asphalt. The second stage involves development of specifications for microsurfacing, slurry seal, chip seal, ultra-thin bonded wearing course, and asphalt crack sealing and filling. The plan will help PRHTA determine when and where to apply preservation techniques based on the level of traffic, pavement condition, and environmental aspects versus major pavement rehabilitation.

In **Tennessee**, TDOT is loading pavement construction project segment data into its pavement management system. This includes historical project locations, costs, and types, such as mill and inlay, microsurface, and thin lift overlay. TDOT developed deterioration models for each major pavement construction and pavement distress. TDOT summarized historical pretreatment conditions to build project selection decision trees that it will use with deterioration models to predict future pavement conditions at various funding levels.



*Advanced, proven preservation practices can help extend the overall service life of pavements.*

# Road Weather Management—Weather-Savvy Roads

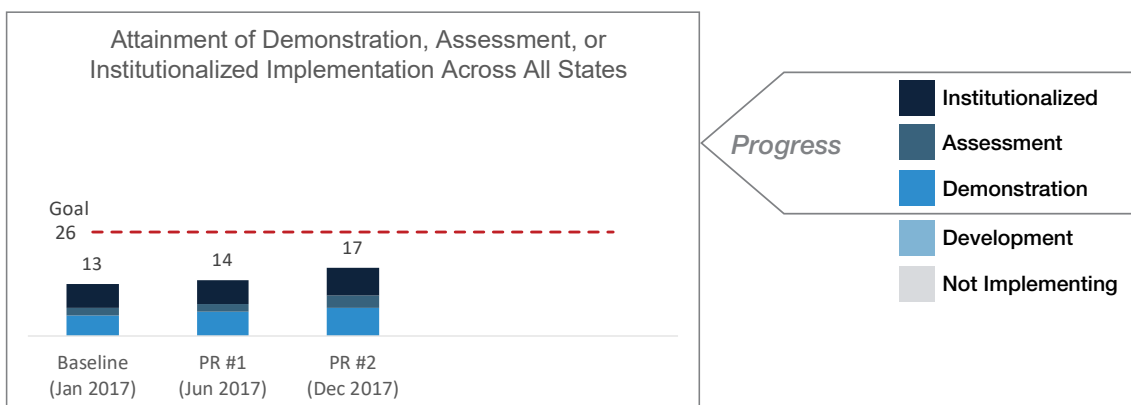
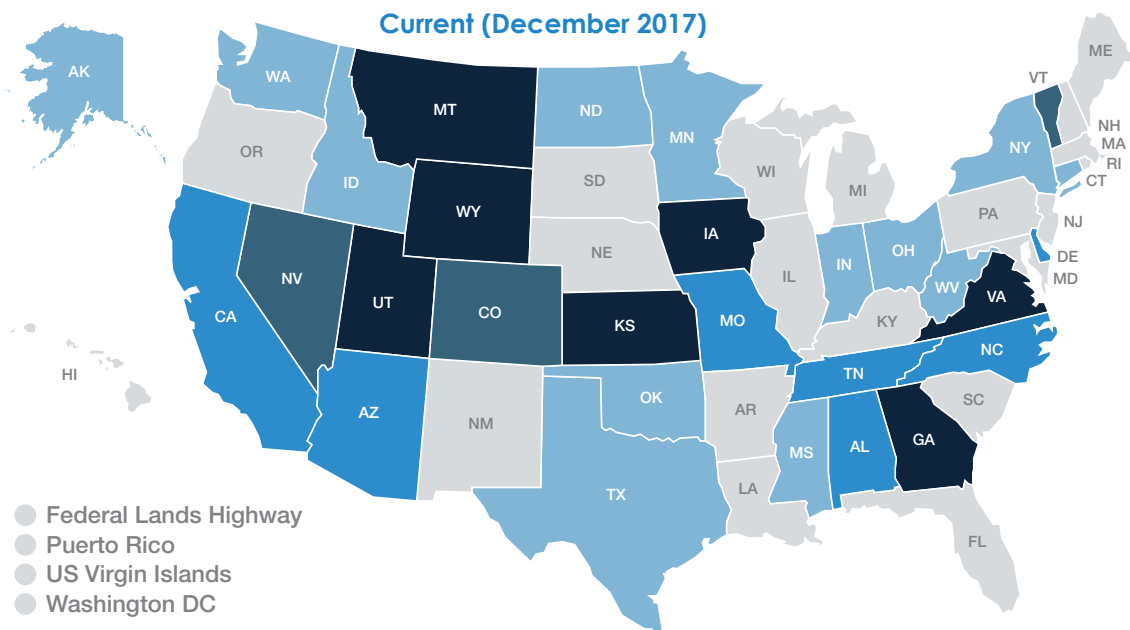
**Road weather management—weather-savvy roads** integrates mobile observations and Pathfinder strategies that can help agencies manage road systems and inform travelers ahead of and during adverse road weather conditions. Twenty-two percent of all vehicle crashes in the past decade were weather-related. On average, these crashes resulted in about 6,000 deaths a year. Adverse weather causes about 25 percent of nonrecurring traffic delays, and weather-related delays add about \$3.4 billion a year to freight costs.

The Pathfinder process enables transportation departments, the National Weather Service, and private weather service providers to collaborate on clear, consistent road weather messaging. It provides the foundation for coordination across agencies to develop cohesive weather impact information that helps drivers make better travel decisions. Ultimately, it saves lives, protects property, and minimizes the impact of weather events.

Integrating mobile observations is a cost-effective way to gather information on weather and road conditions using existing fleet vehicles. Vehicle-based technologies provide agencies with data to manage transportation systems before the negative impacts of road weather occur. Maintaining a high level of service on roads can reduce crashes and keep traffic moving smoothly.

## Road Weather Management: Pathfinder

Thirteen States are developing implementation plans and learning more about the Pathfinder process. Ten States are demonstrating and assessing the Pathfinder process to collaborate on clear, consistent road weather messaging to help drivers make better travel decisions. Seven States have institutionalized the process.

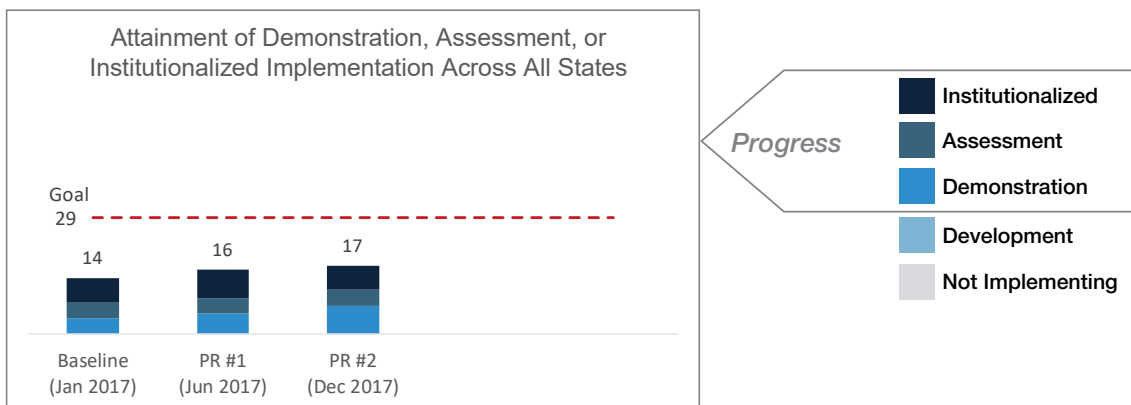
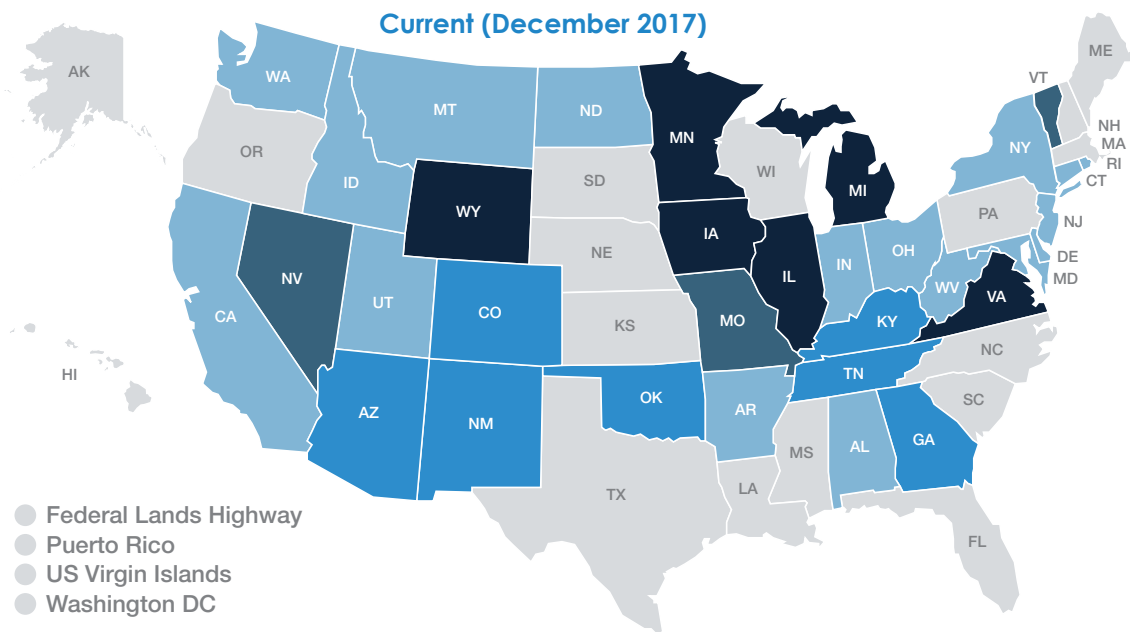






## Road Weather Management: Integrating Mobile Observations

Sixteen States are developing implementation plans and learning more about integrating mobile observations into their road weather management processes. Agencies in 11 States are demonstrating and assessing vehicle-based technologies to gather data to use to mitigate the negative impacts of road weather. Six States have made integrating mobile observations a standard practice.



## Road Weather Management—Weather-Savvy Roads

In **Arizona**, ADOT conducted a Pathfinder pilot during the summer 2017 monsoon season. The pilot enhanced collaboration between ADOT and the National Weather Service (NWS) and enabled better consensus on weather event response. As a result of the pilot, ADOT will implement Pathfinder in the Flagstaff area on I-17 and I-40. ADOT equipped 75 percent of its snowplow fleet with automatic vehicle location technology. Twenty-five percent these vehicles also have barometric and humidity sensors. ADOT has management tools in place to access post-storm data and develop reports.

In **Colorado**, CDOT will institutionalize Pathfinder based on its success with the program and expand collaboration to local agencies. CDOT is also reworking its Variable Message Sign Board Guideline Manual for traffic operations center operators to focus on weather-related road impacts. CDOT notes that Pathfinder program benefits include cost savings on material use through improved prestorm communication and collaboration.

In **Connecticut**, CTDOT received AID Demonstration funds to deploy integrated mobile observation technology on fleet vehicles. This includes 16 plows equipped with modems to transmit Global Positioning System coordinates along with road and air temperature data. Three vehicles are also equipped with front-facing cameras to transmit the driver's windshield view.

As part of its Pathfinder deployment effort, the **Idaho** Transportation Department (ITD) is preparing a list of triggering events for Pathfinder-related dynamic message sign postings. ITD developed flow charts that illustrate the message posting decision process and how to maintain logs of Pathfinder message posting activities to assist with process improvements.

Implementing Pathfinder enabled **Mississippi** to reduce conflicting messaging during weather events and produce more targeted messaging based on local impacts. Examples include the Jackson NWS Office, which now incorporates surface traffic impacts in its warning and advisory messages and directs viewers to MDOT traffic information resources.



*Pathfinder and IMO lead to informed decisions by operators and users prior to adverse weather events.*

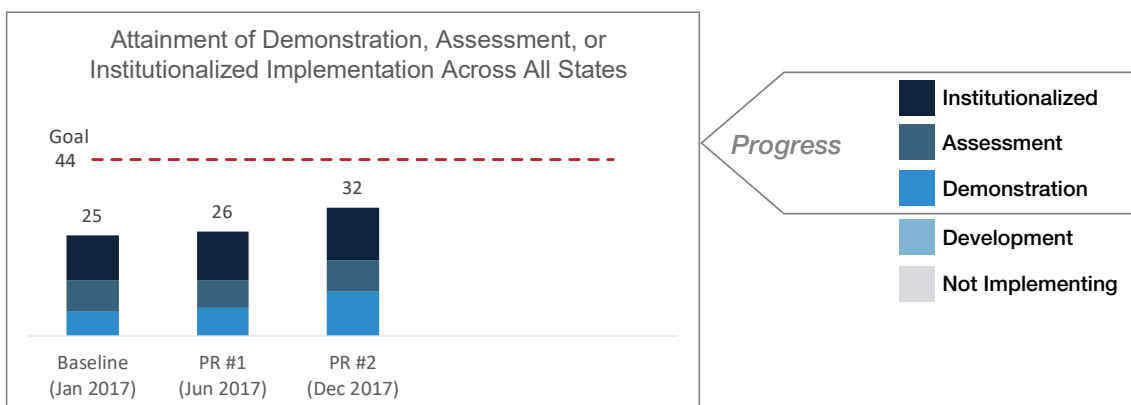
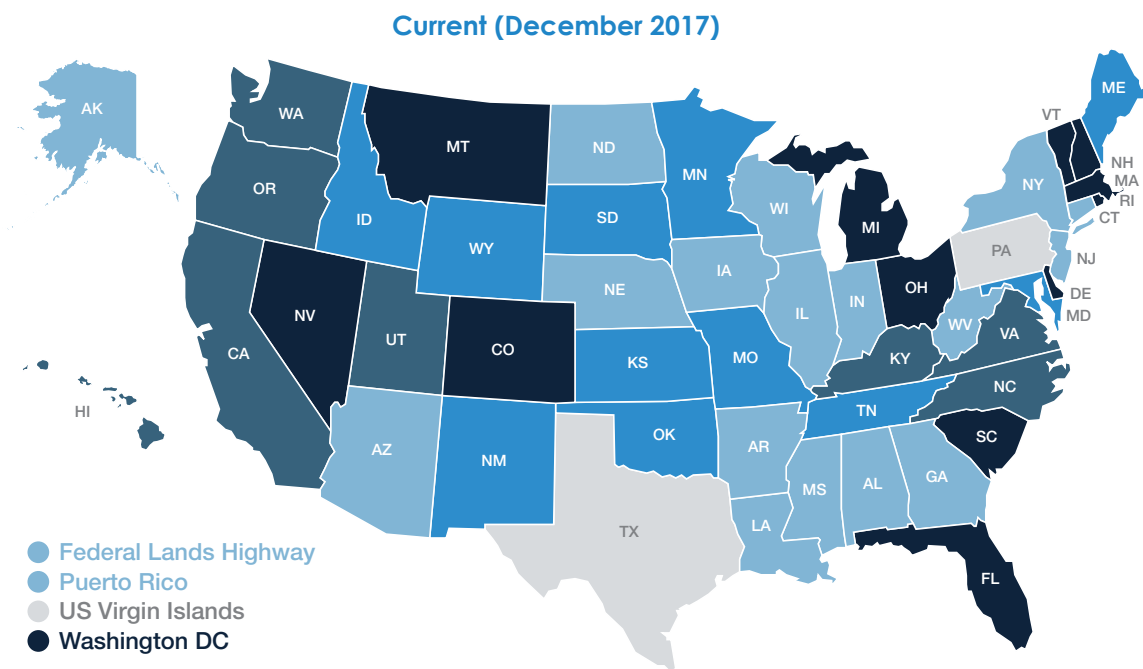
# Safe Transportation for Every Pedestrian (STEP)

**Safe transportation for every pedestrian (STEP)** features proven, cost-effective countermeasures that can reduce pedestrian fatalities at uncontrolled crossing locations and unsignalized intersections. Pedestrians account for more than 16 percent of all traffic fatalities. More than 72 percent of pedestrian fatalities occur at nonintersection locations such as midblock areas.

The STEP program includes five safety countermeasures:

- **Crosswalk visibility enhancements**, such as crosswalk lighting and enhanced signing and marking, help drivers detect pedestrians.
- **Raised crosswalks** are a traffic calming technique that can reduce vehicle speeds and encourage drivers to yield to pedestrians.
- **Pedestrian refuge islands** provide a safer place for pedestrians to stop at the midpoint of the road before crossing the remaining distance.
- **Pedestrian hybrid beacons** provide pedestrian-activated stop control in areas where pedestrian volumes are not high enough to warrant a traffic signal.
- **Road diets** reconfigure a roadway cross-section to safely accommodate all users.

The STEP program is expanding the use of safety countermeasures to reduce pedestrian fatalities. Seventeen States, FLH, and Puerto Rico are in the beginning stages of implementation. Nineteen States are demonstrating and assessing STEP countermeasures. Twelve States and Washington, DC, have institutionalized STEP countermeasures.





## Safe Transportation for Every Pedestrian (STEP)

In **Connecticut**, CTDOT is developing an asset inventory of all uncontrolled pedestrian crossings. The first step involved identifying all locations on State roads. These data were incorporated into the geospatial linear referencing system for more than 200 uncontrolled pedestrian crossing locations. The effort will also include improving the local road uncontrolled crossing location database, which will support a project to upgrade visibility (signs and pavement markings) on locally owned roads.

The **Maine** Department of Transportation (MaineDOT) held eight “Crosswalk and Sidewalk Safety” workshops for local agency engineers and planners through the Maine Local Roads Center, the State’s Local Technical Assistance Program center. Workshop participants learned about MaineDOT’s updated engineering guidance on crosswalks and **road diets** to identify appropriate locations for STEP countermeasures. Participants were encouraged to deploy STEP countermeasures through a MaineDOT crosswalk program funded by the Federal-Aid Highway Program.

Several communities and States adopted policies and procedures to deploy STEP treatments, including the city of Boulder, CO; Lexington (KY) Area Metropolitan Planning Organization; North Carolina Department of Transportation (NCDOT); and Oregon Department of Transportation. NCDOT adopted **North Carolina Pedestrian Crossing Guidance** to promote consistency in crossing treatment recommendations across the agency’s 14 divisions. A four-step flowchart walks users through sequenced assessments that result in a recommendation, required action, or no required action.



*Knowing how to determine good crossing locations and which countermeasures to use enables highway agencies and other organizations to increase pedestrian safety.*

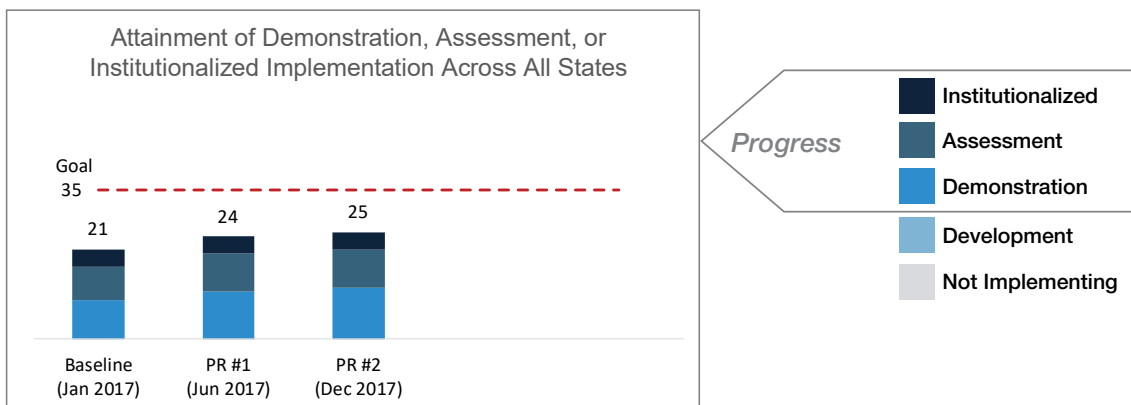
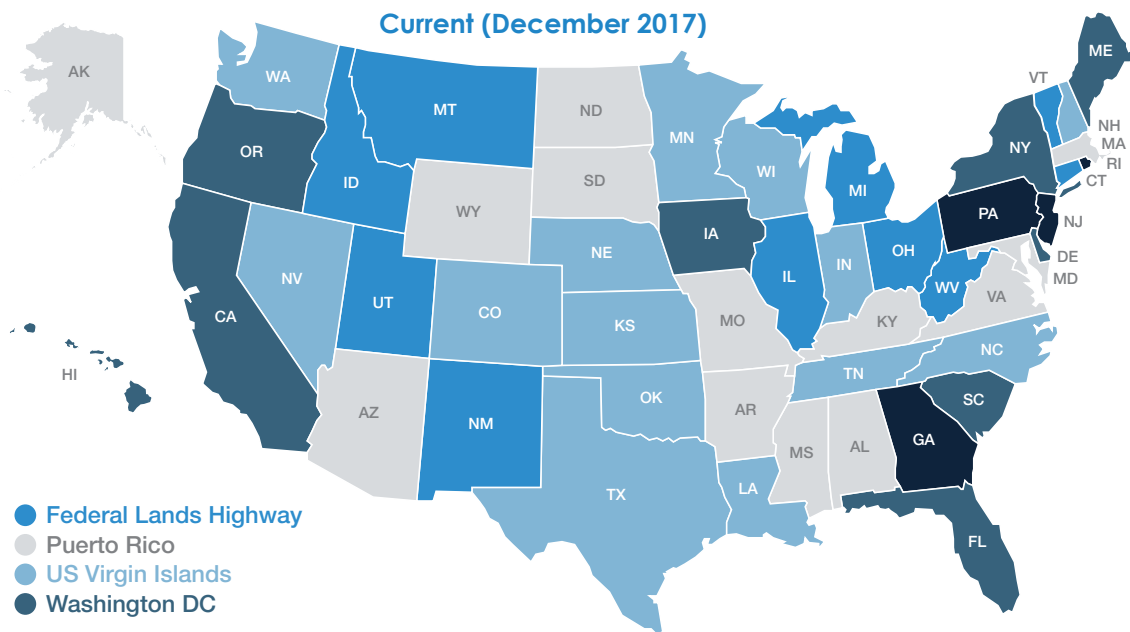
# Ultra-High Performance Concrete Connections for Prefabricated Bridge Elements

**Ultra-high performance concrete** (UHPC) can be used to create the simple, strong, long-lasting connections needed for successful construction using prefabricated bridge elements. UHPC is a steel fiber-reinforced, portland cement-based composite material that delivers performance far exceeding conventional concrete.

Prefabricated bridge elements, structural components that are built offsite and brought to the project location for installation, shorten onsite construction time, enhance safety, and offer superior durability. Field-cast UHPC has emerged as a solution for creating connections between prefabricated components with better long-term performance than typical connection designs.

UHPC allows for small, simple-to-construct connections that require less concrete and do not require post-tensioning. The mechanical properties of UHPC allow for redesign of common connection details in ways that promote ease and speed of construction. This makes using prefabricated bridge elements simpler and more effective.

Fourteen States and the U.S. Virgin Islands are developing implementation plans and learning more about the use of UHPC connections. Nineteen States, FLH, and Washington, DC, are demonstrating and assessing the use of UHPC connections in bridge-building processes. Four States have made UHPC connections a standard practice on bridge projects that use prefabricated elements.





## Ultra-High Performance Concrete Connections for Prefabricated Bridge Elements

Over the past 6 months, **FLH** and the **California, Connecticut, and New Mexico** Departments of Transportation had their first bridge projects with UHPC connections under design or construction. FLH had four projects in design and scheduled for construction in 2018, including the Arlington Memorial Bridge project in Virginia. Caltrans awarded two projects using UHPC to connect precast columns to precast pier caps. CTDOT had two projects at the design stage, and New Mexico had four projects in design.

Among agencies that completed one bridge project with UHPC in the past, six had new projects with UHPC under design or construction in the past 6 months. The **Nebraska** Department of Transportation finalized design of its second project. The **District** Department of Transportation completed design of its second and third projects. The **Florida** and **Illinois** Departments of Transportation had their second projects under construction, and the **Idaho** Transportation Department had its second and third projects under construction. The **Ohio** Department of Transportation finished construction of its second project and design of its third project.

In **Delaware**, DelDOT completed the Nation's second bridge deck overlay using UHPC on the Blackbird Station Road project in New Castle County. DelDOT also used UHPC to connect the adjacent box girders on the project. The **Iowa** Department of Transportation has the country's third project with a UHPC bridge deck overlay under design, with construction planned for spring 2018. The first U.S. project with a UHPC bridge deck overlay was built in Iowa in 2016.

The **Michigan** Department of Transportation (MDOT) is working with the University of Michigan to develop a nonproprietary UHPC mix. MDOT is coordinating with a local agency in St. Clair County to use the UHPC mix to repair, strengthen, and seal the top flange of a double tee beam bridge.



UHPC connection details make using prefabricated bridge elements simpler and more effective for accelerated bridge construction.

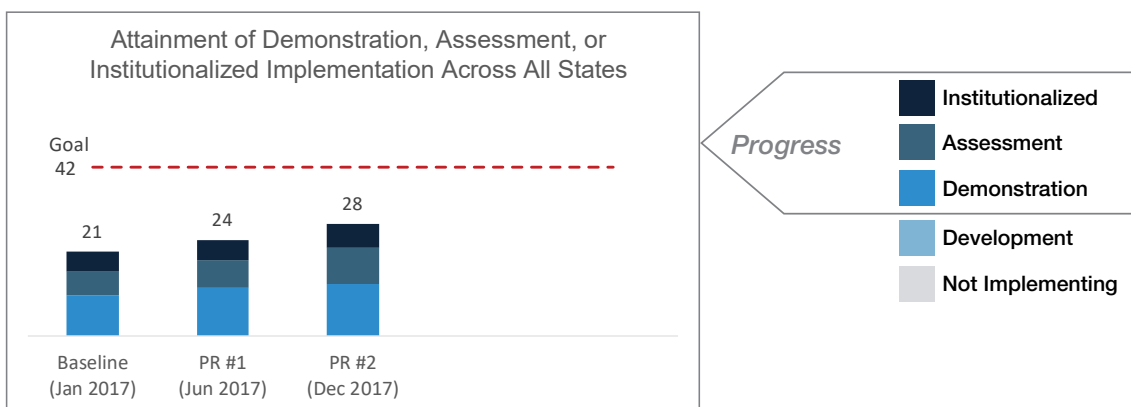
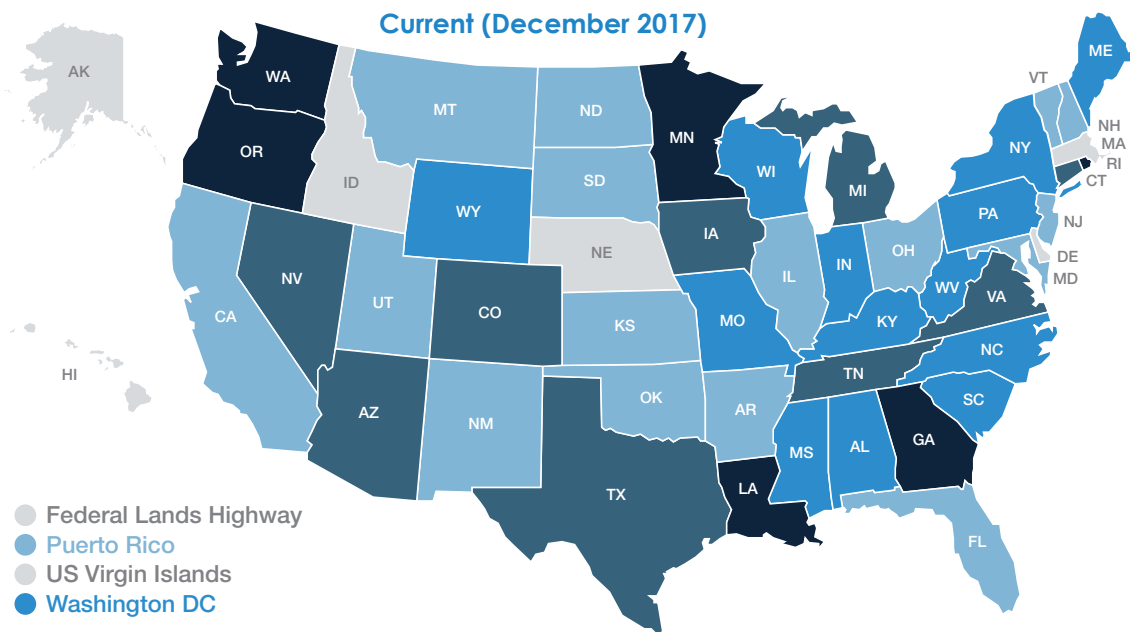
# Using Data to Improve Traffic Incident Management

**Using data to improve traffic incident management (TIM)** focuses on increasing the amount, consistency, and quality of data collection to support the development of performance measures for evaluating and improving traffic incident response programs.

Traffic incidents put travelers' and emergency responders' lives at risk and cause a quarter of all traffic delays. Resulting congestion can lead to secondary crashes. TIM programs to coordinate response among agencies are reducing the duration and impact of incidents.

FHWA is promoting the use of low-cost, off-the-shelf technologies to collect data to help agencies enhance TIM programs. FHWA is also encouraging adoption of three key TIM performance measures: roadway clearance time, incident clearance time, and number of secondary crashes. With better data, agencies can quantify program performance, demonstrate program effectiveness, and improve planning and resource management.

Seventeen States and Puerto Rico are learning more, have plans, and are in the process of preparing to use data to improve TIM. Twenty-one States and Washington, DC, are demonstrating and assessing approaches and/or technologies to collect data and adopt TIM performance measures to evaluate and improve their TIM programs. Six States have made using data to improve TIM a standard practice.



## Using Data to Improve Traffic Incident Management

In **Tennessee**, TDOT is developing a new traffic management center software system and database to streamline processes, improve data quality, and allow central processing of statewide data. The system will merge the functions of two data collection systems, the incident management database that feeds the State's 511 system and the incident management system used in traffic management centers. The Tennessee Highway Patrol (THP) is implementing a new integrated computer-aided dispatch (CAD) system, and TDOT plans to procure the same CAD software so it can pull THP data directly into its new system.

In **Pennsylvania**, PennDOT combined crash information from the Pennsylvania State Police crash report, PennDOT Road Condition Reporting System, private sector traffic data, and crowdsource data to create an incident timeline and its first TIM performance report. PennDOT developed a web-based tool that allows review of individual incidents as well as aggregated data at the roadway and regional levels. PennDOT is calibrating a tool to provide early warning and detection of incidents through the integration of traffic and crowdsource data. The agency hopes to apply the methodology to its advanced traffic management system in 2018.

Several States are enhancing their TIM data foundations by collecting new data, analyzing previously overlooked data, and standardizing data collection practices. In **Indiana**, traffic management center operators were trained to record key data elements for roadway and incident clearance times and transform text data to numerical formats to support data analysis. **South Carolina** changed its traffic management center software to accommodate the collection of the three national TIM performance measures. Fifteen states are modifying their statewide crash forms to include secondary crash reporting.



*As TIM activities increase across the country, so does the need to capture data that can be used to assess program performance and drive improvements.*



## ACRONYMS AND ABBREVIATIONS

|                         |   |
|-------------------------|---|
| 2D.....                 | two-dimensional   |
| AASHTO .....            | American Association of State Highway and Transportation Officials        |
| ADOT .....              | Arizona Department of Transportation                                      |
| AID Demonstration ..... | Accelerated Innovation Deployment Demonstration                           |
| Alaska DOT&PF.....      | Alaska Department of Transportation and Public Facilities                 |
| ATSPMs .....            | automated traffic signal performance measures                             |
| CAD .....               | computer-aided dispatch   |
| Caltrans.....           | California Department of Transportation                                   |
| CDOT .....              | Colorado Department of Transportation                                     |
| CHANGE .....            | collaborative hydraulics: advancing to the next generation of engineering |
| CTDOT .....             | Connecticut Department of Transportation                                  |
| CWA .....               | Clean Water Act   |
| DDSA .....              | data-driven safety analysis   |
| DelDOT .....            | Delaware Department of Transportation                                     |
| DOT.....                | department of transportation  |
| DSRC.....               | dedicated short-range communication                                       |
| EDC.....                | Every Day Counts  |
| EDC-3.....              | Every Day Counts round three  |
| EDC-4.....              | Every Day Counts round four   |
| EPA.....                | Environmental Protection Agency   |
| FAST Act .....          | Fixing America's Surface Transportation Act                               |
| FHWA .....              | Federal Highway Administration  |
| FLH .....               | Federal Lands Highway   |
| GDOT.....               | Georgia Department of Transportation                                      |
| HSIP .....              | Highway Safety Improvement Program  |
| ITD .....               | Idaho Transportation Department   |
| MaineDOT.....           | Maine Department of Transportation  |
| MDOT.....               | Michigan Department of Transportation                                     |
| MDOT.....               | Mississippi Department of Transportation                                  |
| MDT.....                | Montana Department of Transportation                                      |
| MIRE .....              | Model Inventory of Roadway Elements                                       |
| MnDOT .....             | Minnesota Department of Transportation                                    |
| MoDOT .....             | Missouri Department of Transportation                                     |
| NCDOT .....             | North Carolina Department of Transportation                               |
| NDOT .....              | Nevada Department of Transportation                                       |
| NEPA.....               | National Environmental Policy Act   |
| NJDOT.....              | New Jersey Department of Transportation                                   |

|               |  |
|---------------|--|
| NMFS.....     | National Marine Fisheries Service                |
| NWS .....     | National Weather Service                         |
| ODOT.....     | Ohio Department of Transportation                |
| PennDot ..... | Pennsylvania Department of Transportation        |
| PRHTA .....   | Puerto Rico Highway and Transportation Authority |
| STEP .....    | safe transportation for every pedestrian         |
| STIC .....    | State Transportation Innovation Council          |
| TDOT .....    | Tennessee Department of Transportation           |
| THP .....     | Tennessee Highway Patrol                         |
| TIM.....      | traffic incident management                      |
| UDOT.....     | Utah Department of Transportation                |
| UHPC .....    | ultra-high performance concrete                  |
| USACE.....    | U.S. Army Corps of Engineers                     |
| USFWS .....   | U.S. Fish and Wildlife Service                   |
| VDOT .....    | Virginia Department of Transportation            |
| WSDOT.....    | Washington State Department of Transportation    |

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“The EDC delivery model has been a great help to DeIDOT in deploying new innovations. It jump started the implementation process in Delaware. Having access to the advice and guidance from practitioners at the other State DOT’s is a valuable resource to States just starting a deployment of their own.”

*Robert McCleary*  
*Chief Engineer*  
*Delaware Department of Transportation*

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U.S. Department of Transportation  
**Federal Highway Administration**