Federal Highway Administration (FHWA) Research and Technology Agenda

Meeting the Challenge: Federal Lands

Twenty-eight percent of land in the United States is under Federal stewardship, including national parks, forests, and wildlife refuges and Tribal and other Federal lands. Developing and maintaining the transportation networks within these areas pose unique challenges for transportation professionals. FHWA is helping Federal agencies and Tribal governments improve safety, streamline the environmental review process, and reduce congestion; all while protecting natural and cultural resources and meeting the needs of the many different communities served by these roads.

In partnership with diverse agencies, such as the National Park Service (NPS), the Army Corps of Engineers, and the U.S. Fish and Wildlife Service, FHWA is identifying new construction and maintenance techniques that are appropriate for environmentally sensitive and sparsely populated rural areas. Highways located on Federal lands often serve as test beds for innovations used by State and local highway agencies on their rural roads.

To speed the delivery of transportation improvements, the FHWA is cultivating streamlined project development and environmental review processes that integrate the activities of diverse agencies. The agencies may be from different levels of government and may have different points of view, based on missions ranging from construction to resource conservation, or finance, but they all work together to advance projects. This collaboration enhances the efficiency and quality of transportation projects on Federal lands.

Objective: 1: Enhance Federal Land Management Agency, Tribal, and public road systems to improve transportation access, movement, and traveler experience.

Strategies

- Identify stakeholder transportation needs for roads to assist them in planning, designing, and constructing roads that meet safety and design standards with the fewest possible environmental impacts.
- Promote technologies and solutions that monitor traffic, manage congestion, optimize road and visitation facility capacity, and encourage alternative transportation such as shuttles, bicycles, and buses to include special consideration for seniors and people with disabilities.
- Encourage inventory, data collection, and asset management programs that support decisionmaking to maximize the use of agency resources; reduce impacts to travelers; enhance roadway and bridge safety; and preserve historical, cultural, environmental, ecological, economic, and recreational attributes.
- Provide for "green" highways and context-sensitive solutions; measure and document roadway sustainability; and reduce traffic and construction noise and vibrations.

Showcase Activities

- Making Mather Point/Visitor Center Improvements: Grand Canyon National Park

Making Mather Point/Visitor Center Improvements: Grand Canyon National Park

Access to the spectacular views of Mather Point on the Grand Canyon's South Rim has not always been available to all visitors, especially those with physical challenges or those requiring additional support. Beginning in 2009, the National Park Service, with support from FHWA and the Grand Canyon Association, undertook a series of improvements to Mather Point and the Grand Canyon Visitor Center. The improvements included additional parking, a trail for a vehicle-free visitor experience at Mather Point, picnic areas, a new amphitheater on the canyon rim, and many informational and interpretive improvements to the visitor center plaza. The work was conducted using an innovative combination of geotechnical investigation techniques to support reliable and prudent design of trail and facilities in compliance with the Americans with Disabilities Act. These techniques blended mapping and geophysics with traditional geotechnical approaches (coring, sampling, and strength testing). In addition, available land was creatively used to relocate the road, construct parking lots, and add shuttle facilities to guide vehicles, tour buses, and shuttles into designated areas to improve traffic flow and reduce congestion. Today, the new improvements

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Additional Resources

- National Park

designated areas to improve traffic flow and reduce congestion. Today, the new improvements provide accessibility and enhance the visitor experience by creating a more iconic impression of the Grand Canyon for future generations.

- Service: Mather Point/Visitor Center Improvements
- National Park Service: Parking Near the Visitor Center and Mather Point (Click the video link at the bottom of page.)

Objective: 2: Improve Federal Land Management Agency, Tribal, and public road systems to enhance safety.

Strategies

- Provide technical assistance and project support services to stakeholders to make transportation facilities safer to include road safety audits, reduce wildlife-vehicle interaction, and identify high-crash locations.
- Identify and deploy safety initiatives to improve safe transportation to and within Federal and Tribal lands to include road safety audits, crashworthiness of guardrails, visibility of sign and pavement markings, and protections for work zones.

Showcase Activities

- Developing the Haxton Way Pedestrian Path: Whatcom County, Bellingham, Washington

Developing the Haxton Way Pedestrian Path: Whatcom County, Bellingham, Washington

The driving force behind the Haxton Way Pedestrian Path was the Lummi Nation's concern for the life and safety of pedestrians and bicyclists who use the existing roadway to reach community amenities. Haxton Way is a narrow, two-lane road with a fog line and a few inches of a paved shoulder. To improve safety and enhance the experience for nonmotorized travelers, an elevated, eight-foot-wide multiuse pathway was constructed on wetlands adjacent to Haxton Way. Solar-powered lighting along the newly constructed trail provides a low-intensity, environmentally friendly, cost-saving solution. Low-voltage, light-emitting diode lamps were mounted on each pole with a solar panel and battery pack. Each lamp utilizes motion, light, and proximity sensors to provide low-intensity (25 percent) lighting after sunset and full-intensity (100 percent) brightness as pathway users approach each post. Choosing a solar solution in this environmentally sensitive area also reduced the construction impact that is typically associated with conventional lighting. Since the completion of the project, no injuries, deaths, or crashes have been reported. Members of the Lummi Nation community have praised the project for providing a safe, well-lit way to travel along the road.

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Additional Resources

- FHWA: Lummi Nation Haxton Way Pedestrian Path and Lighting Project (VIDEO)

Objective: 3: Streamline Federal Land Management Agency and Tribal processes to improve timeliness and effectiveness of program and project delivery.

Strategies

- Ensure the effectiveness of the Federal Lands Highway Program with condition and performance assessment initiatives.
- Promote and provide technical assistance on environmental streamlining to improve the effectiveness of transportation project delivery.
- Further link the transportation planning and National Environmental Policy Act (NEPA) processes to ensure efficient transportation project delivery and increase the quality of the National Environmental Policy Act processes.
- Engage partner agencies to develop long-range transportation plans based on transportation asset management priorities and performance-based principles.
- Provide quality education materials and sponsor training to accompany improved, enhanced, and streamlined project delivery programs, studies, recommendations, and guidance.

Showcase Activities

- Promoting Roadside Revegetation: An Integrated Approach to Establishing Native Plants
- Using Construction Manager/General Contractor at the Point Bonita Lighthouse Bridge Replacement

Promoting Roadside Revegetation: An Integrated Approach to Establishing Native Plants

Integrating safe, efficient transportation with ecological health is a crucial issue that is receiving increased attention. Today, most road projects involve modifications to existing roads rather than new construction. Modifying roads or updating them section by section presents a tremendous opportunity to remedy the oversights of the past, mitigate environmental impacts, and improve conditions for healthy ecosystems. Through the Coordinated Technology Implementation Program, FHWA and the U.S. Forest Service developed a comprehensive Roadside Revegetation Technical Guide, which offers an integrated approach to facilitate the successful establishment of native plants along roadsides and other areas of disturbance associated with road modifications. The guide introduces readers to a comprehensive process of initiating, planning, implementing, and monitoring a roadside revegetation project with native plants. A Web site was developed to support the guide. The Web site contains four integrated and interlinked modules dedicated to explaining the art and science of roadside revegetation.

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Additional Resources

- Roadside Revegetation: An Integrated Approach to Establishing Native Plants
- Roadside Revegetation Technical Guide

Using Construction Manager/General Contractor at the Point Bonita Lighthouse Bridge Replacement

The Point Bonita Lighthouse Bridge is a 156-foot-long timber pedestrian suspension bridge located in the Golden Gate National Recreation Area in Marin County, California. Originally constructed in 1954, the bridge is a part of the Point Bonita Historic District, which is listed in the National Register of Historic Places. Lack of maintenance and the harsh coastal marine environment resulted in corrosion of the structure's timber and steel cables. Because of this deterioration, the bridge was closed to the public in 2010 and FHWA was asked to replace it. Project constraints included limited funding, a limited construction window due to environmental restrictions, a required 50-year design life for the new structure given the harsh marine climate, a long lead time to acquire specialized construction materials (timber, stainless steel), and difficult site access (that is, accessing the site requires navigating a trail and a tunnel). The project used Construction Manager/General Contractor contracting to help address the constraints and technical challenges for design and construction. This type of contracting involves engaging a construction manager during a project's design phase to provide input on design and constructability with an option to award the same contractor a construction contract at a later point. The Construction Manager/General Contractor method began in the design phase and fostered knowledge sharing and a partnership between FHWA, the contractor, an engineering firm, and the National Park Service. Because of this partnership, the construction was completed on time and under budget with a limited number of contract modifications. The National Park Service was extremely satisfied with the final product and the project team worked cooperatively, which fostered innovation and led to the overall success of the project.

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Objective: 4: Deploy new, emerging, underused, and innovative technologies to accelerate project delivery and improve sustainability of low-volume, low-speed roadways.

Strategies

- Deploy innovative and emerging technologies to accelerate project delivery, improve safety, and provide solutions to unique situations.
- Provide Federal Lands Highway projects as testbeds to field test research advanced by FHWA's Turner-Fairbank Highway Research Center.
- Work with the Transportation Research Board Low-Volume Roads Committee and the American Association of State Highway and Transportation Officials to define research priorities for low-volume roads that address FHWA's Office of Federal Lands Highway stakeholders' needs.

Showcase Activities

- Producing Rockery Design and Construction Guidelines

- Collaborate with the Local Technical Assistance Program and Tribal Technical Assistance Program centers to provide training, technology transfer, and research opportunities that improve the abilities of stakeholders to deliver more effective and safer transportation projects.
- Document new and emerging technologies that support project delivery and share them with the transportation community by engaging partners and customers through appropriate forums.

Producing Rockery Design and Construction Guidelines

Rockeries, or dry stack walls, are rough, natural, onsite rock structures that are stacked and interlocked with no mortar, concrete, or steel. Rockeries retain and protect earth-cut or fill slopes. They provide examples of relatively low-cost, long- lasting, safe, and visually pleasing context-sensitive solutions. Civilian Conservation Corp workers built many impressive rockeries in the late 1930s; today some still perform their function effectively. Several of these historic or culturally important rockeries enhance the visitor experience on many forest highways and national park roads. Engineering reviews of functioning rockeries, those in need of maintenance, or failed rockeries offer key design and construction considerations to use in current building practices. Prior to 2006, no standards, specifications, or other accepted procedures existed to provide construction or design guidance for rockeries; however, rockeries functioned well in many different types of environments, suggesting that excellent performance could be expected when certain conditions were met. A rational, tested design procedure was needed to provide designers and owners with confidence that rockery structures could be used as part of modern highway engineering. To meet this need, FHWA produced design and construction guidelines to define and evaluate the stability of rockeries given specific geometries (height, base width, and batter); rock properties and placements; and lateral pressures of backfill materials. These guidelines also include construction quality assurance steps, standard plan drawings, and construction specifications. To date, 22 rockeries were built following these guidelines, resulting in positive cost benefits averaging $40 to $50 per square foot compared with $70 to $100 per square foot for traditional soil nail walls. This value is obtained by using onsite materials and eliminating the need for aesthetic treatments, which cover the soil nail system.

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Additional Resources

- FHWA: Rockery Design and Construction Guidelines