

I-70 Risk and Resilience Pilot

Background

The September 2013 flood event in Colorado lasted seven days, and left behind a considerable wake of destruction that spanned some 2,380 square miles.

More than 3,000 military evacuations were carried out, over 28,000 homes were damaged, and some 1,800 were completely destroyed. The Colorado roadway network suffered severe damage exceeding \$700 million to Federal Aid-eligible facilities alone.

Following this extreme weather event, one of many that [Colorado has experienced](#), the [Colorado Department of Transportation](#) (CDOT) sought to identify design alternatives that would increase the resilience of the affected sites. In particular, they sought to address their vulnerabilities to future shock events through comprehensive analysis and integrated design approaches, which help mitigate and minimize future losses.

As part of the disaster recovery process, CDOT, in cooperation with the [Colorado Division Office of the Federal Highway Administration](#) (FHWA), rebuilt Federal Aid-eligible facilities. CDOT worked with FHWA to identify eligible design improvements, known as “betterments,” to reduce the potential for future losses from similar flood events.

The [May 2013 FHWA Emergency Relief \(ER\) Manual](#), the most recent guidance document for FHWA’s recovery program, includes language enabling the inclusion of design elements that improve the resilience of Federal Aid assets lost in emergency events. CDOT sought out to determine if they could reduce the likelihood of future losses through the deployment of economically justified betterments. To that end, CDOT partnered with Applied Engineering Management (AEM) Corporation to develop an economic analysis methodology to analyze the anticipated performance of betterments as compared to replacing the asset “in-kind.” These studies have supported additional investments to flood damaged assets with the goal of reducing future damages and accompanying requests from CDOT for FHWA ER funding.

Challenge

Traversing the Rocky Mountains and serving as the primary east-west corridor, I-70 is a vital corridor in the Colorado transportation system, that enables commercial and personal travel central to Colorado’s economy and transportation network. Due to Colorado’s unique topography, there is little redundancy for I-70 in many locations. It is therefore imperative that CDOT determine the vulnerability and resiliency of this critical corridor so that the State is better situated to resist, absorb, and recover from the impact of any potential future shock event.

Resiliency Sector: Infrastructure
Organizations: Colorado Department of Transportation; Applied Engineering Corporation

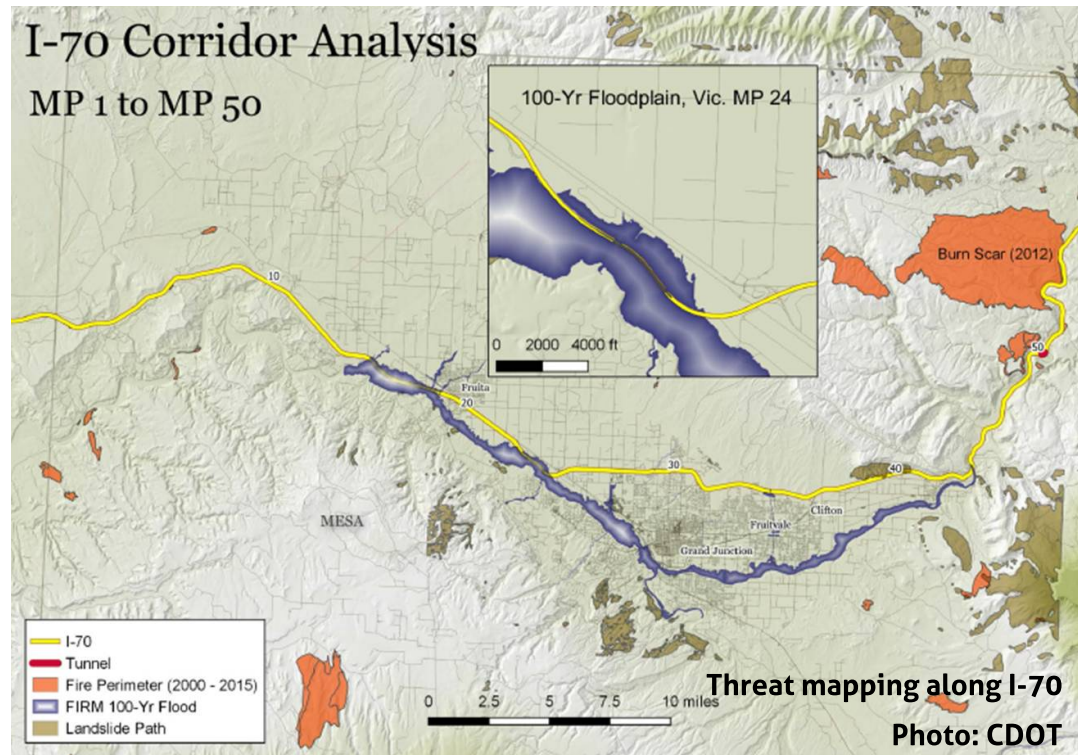


Fallen boulders on I-70 in Glenwood Canyon

Photo: CDOT

Solution

Building on the lessons learned from the 2013 flood event, CDOT has partnered with AEM to launch a pilot project known as the I-70 Risk and Resilience Pilot. Began in August 2016, this year-long project will assess hazards along the entire I-70 corridor from border to border to identify: areas with high probability of losses from a range of threats, both natural (e.g., flooding) and direct (e.g., bridge strikes); the anticipated damages from these potential threats; and, the corridor's ability to adapt to these threats.



Employing similar processes as to those used on the flood recovery effort, the team has worked to create a blueprint that will facilitate the identification of the most vulnerable assets and cross-referenced them against the likelihood of specific threats from adverse events on the I-70 corridor.

The project team is made up of a wide range of CDOT staff from all five agency regions, staff from its Division of Transportation Development, technical experts from AEM and department executives. By engaging a wide range of engineering, maintenance, operational, planning, and executive staff, the project is benefiting from the collaboration and shared knowledge across multiple areas of expertise. This will help build buy-in across the agency for the proactive approach to system resilience and risk management.

Initial Findings

The I-70 Risk and Resilience Pilot is anticipated to be completed in Fall 2017. When completed, it will help provide CDOT with risk and resilience information for assets along I-70 and to prioritize work at key locations where risk is high and resiliency is currently low. Preliminary results have already provided three key pieces of information important to CDOT for decision-making:

1. Criticality rating reflecting each asset's impacts on overall system performance.
2. Annualized monetary risk from potential threats for each analyzed asset.
3. Measure of resilience of each analyzed asset reflecting the impact to the traveling public from potential threats.

CDOT is beginning to explore how the information gained from the pilot project can help them make informed decisions regarding future asset management and prioritization processes, as well as infrastructure maintenance, operational planning, and project design. In addition, CDOT will assess the usefulness of the information provided by the process and determine if future analyses should be conducted.

Lessons Learned to Date

- *Highway risk and resilience analysis is built on data and expertise:* Risk and resilience analysis uses rich CDOT datasets and decades of experience to glean new insights. The results directly support CDOT's performance plan, and information-driven, outcome-based decision making.
- *Highway risk and resilience is part of Colorado's larger [Resiliency Framework](#).* The results enable CDOT to move beyond reactionary responses to anticipating threats and proactively managing threats.
- *Developing resilience strategies is collaborative.* By drawing on the expertise of professionals across CDOT from engineering to maintenance, the I-70 Risk and Resilience Pilot will incorporate varied experiences and knowledge.

Funding

Funding for the CDOT I-70 Risk and Resilience Pilot is provided through normal Federal-Aid Funding agreements between the CDOT and FHWA.

For more information on the I-70 Risk and Resilience pilot project, contact Lize Kemp Herrera with CDOT Region 1 Planning and Program Management at elizabeth.kemp@state.co.us.