VERMONT
AGENCY OF TRANSPORTATION
RESEARCH PROGRAM

Quantifying Bridge Risk using NOAA's Rainfall Data

STUDY TIMELINE
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INVESTIGATORS
Erik Zuker, PE

HNTB Corporation

ezuker@hntb.com

AOT CONTACTS
N / A

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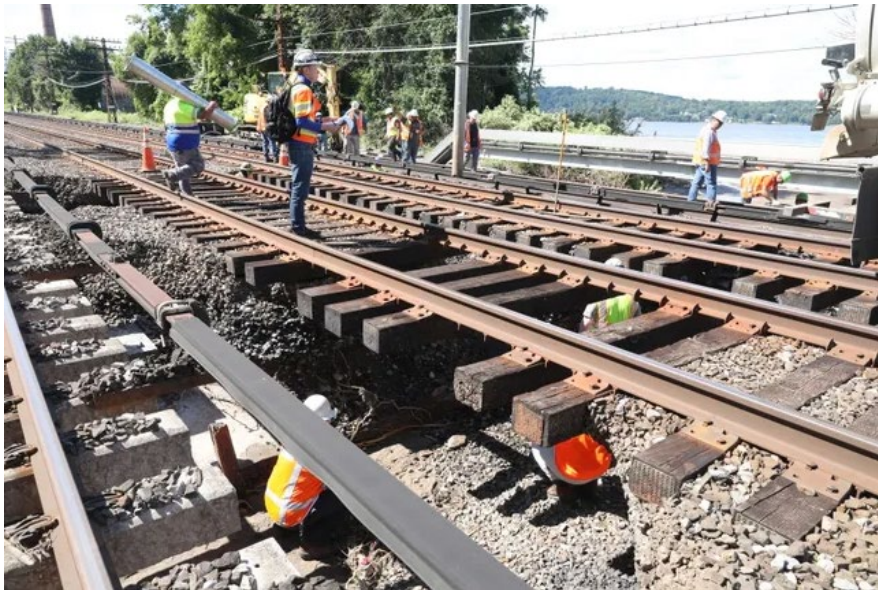
More information about the Agency of Transportation Research Program, including additional Fact Sheets, can be found at: http://vtrans.vermont.gov/planning/research

Introduction

Extreme rainfall and inland flooding are top concerns for the transportation sector because of the safety implications of driving in severe weather, damage to infrastructure, and disruption from significant delays or stoppage of mobility. Understanding when and where these events have occurred and the potential magnitude of these events is exceedingly difficult, especially for isolated extreme downpours (microbursts/cloudbursts).

According to FEMA, over 40% of flood damage claims made from 2017 to 2019 were for properties outside of official mapped flood hazard zones. This presentation will introduce an approach to better understand and characterize these events and the threats they pose to the transportation sector using high-precision rainfall data from NOAA.



Project Methodology

HNTB's Asset Level Rainfall Analytics Exercise (ALRAE) uses a multi-state, multi-year rainfall dataset to create a "virtual rainfall gauge" that reports rainfall estimates at thousands of bridges. This presentation will demonstrate how ALRAE can be used for forensic analyses of storms and bridge failures (and survivors) and to characterize the nature of actual extreme events against current design storm events. This

presentation will share practical examples of how ALRAE can be used to improve resilience by helping the transportation sector prepare, adapt, and respond to extreme weather.

Conclusions / Next Steps

The restructuring of NOAA's rainfall dataset has led to new insights on isolated extreme rainfall behavior and the overall risk to a population of assets. By examining recent observed data, the best available information is leveraged to quantify the threats to existing transportation infrastructure.

Dashboards to visualize and quantify the data have also been created to help non-technical users understand and query large rainfall databases. Recent efforts have shifted from bridge specific focus to a generic approach where any asset, location, watershed or roadway can be assessed.

Impacts and Benefits

Most disciplines within the transportation sector are affected by extreme rainfall. In recent years, this threat has become more pronounced. The ability to quantify rainfall extremes for specific locations both historically and in near real time has the potential to benefit numerous areas of VTrans, not least of which increasing the overall resilience of the transportation network.

Besides helping to understand the past demands on bridges and culverts, the data could also be used to assess current and proposed design criteria. Quantifying and visualizing observed extremes can be used to communicate risk to non-statisticians. On the operational side, there is potential to more effectively deploy personnel during and immediately after an extreme events as well as determine the rainfall observed at the watersheds of scour critical structures.