

UTC Project Information	
Project Title	MPC-694 – Calibrating Ground Response Analyses Beneath an Instrumented Bridge using the I-15 Borehole Array and Ground Motions from the Magna Earthquake
University	Utah State University
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Funding Source(s) and Amounts Provided (by each agency or organization)	USDOT, Office of the Assistant Secretary for Research and Technology \$60,000 Utah State University \$60,000
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Start and End Dates	October 11, 2022 to July 31, 2024
Brief Description of Research Project	On March 18, 2020, a magnitude 5.7 earthquake struck the Salt Lake Valley near Magna, Utah. Important ground motions were recorded by a geotechnical borehole array installed near the intersection of I-15, I-80 and SR-201 in Salt Lake City. Borehole arrays play a key role in understanding seismic site response and in calibrating numerical ground response analyses (GRAs). This particular borehole array is even more valuable, as it lies in close proximity to a flyover bridge that is instrumented with 18 accelerometers that recorded structural response during the Magna earthquake. There is a need to study the ground motions recorded by the I-15 borehole array as a means to calibrate seismic GRAs that can inform numerical modeling at bridge sites throughout the Salt Lake Valley where shaking was not recorded. The overarching research objective of this proposal is to perform numerical 2D and 3D GRAs for the I-15 borehole array site using a large, site-specific 3D shear wave velocity model that will be developed from non-invasive methods. The GRAs will then be calibrated at small- to moderate-strains using the ground motions recorded by the borehole array throughout its lifetime and during the 2020 M5.7 Magna earthquake and its aftershocks.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	This research has not yet been implemented in the design of transportation infrastructure. However, key principles for improving seismic site response predictions can easily be adopted by those performing site-specific ground response analyses for transportation infrastructure. For example, limitations associated with performing

	<p>traditional 1D ground response analyses have been illustrated and methods that can be used to rationally account for spatial variability in ground response analyses have been presented.</p>
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	<p>Large earthquakes have historically caused significant damage to transportation infrastructure. Thus, engineers must use predictive models to account for potential seismic forces in the design of infrastructure. This research illustrates that our models for predicting seismic ground response still need to be improved, such that design of our transportation infrastructure is performed in both a safe and economically efficient manner. This research aims to improve future seismic design methods and will ultimately benefit our society by improving our abilities to better predict seismic forces.</p>
<p>Web Links</p> <ul style="list-style-type: none"> • Reports • Project Website 	<ul style="list-style-type: none"> • MPC Final Report – Calibrating Ground Response Analyses Beneath an Instrumented Bridge using the I-15 Borehole Array and Ground Motions from the 2020 M5.7 Magna Earthquake