Background/Objectives

- Bridges affect communities both socially and economically on a daily basis.
- Perform a two part risk analysis of highway bridges and prioritize bridges according to risk score.
  - Vulnerability Assessment: Use FEMA’s HAZUS-MH to evaluate the structural capacity of bridges.
  - Importance Assessment: Score bridges according social and economical significance.
- Clark County, Nevada was the selected study area. More than 1.7 million people live in Clark County (2006).

Procedure

- Identify Site Soil Conditions
  - Site class and water table depth was identified using a database of well logs and measured shear wave velocities.
- Bridge Classification
  - Bridges were classified according to year of construction, number of spans, superstructure material, span type, bent type, and abutment type.
- Assess Bridge Importance
  - Quantifies bridge importance using, life safety, detour length, lifelines, defense route, and historical significance.
- Assess Bridge Vulnerability
  - A fragility curve is a log-normal cumulative distribution curve with parameters of median spectral acceleration, spectral acceleration, and dispersion coefficient accounting for randomness and uncertainty.
  \[ F(D \geq ds, | S_a) = \Phi \left( \frac{1}{\beta} \ln \left( \frac{S_d}{A_i} \right) \right) \]
  - Fragility analysis is performed for ground shaking and ground displacement.
  - Overall vulnerability combines damage probabilities due to both ground shaking and ground displacement.
- Evaluate Overall Bridge Risk Score
  - Utility function used to better control the initial vulnerability and importance scores.
  - Bridge Importance and Vulnerability were combined to find bridge risk scores.
  - Risk scores were used to put together a bridge priority list.

Results/Conclusions

- High risk bridges have characteristics of bridges that have been damaged in previous earthquakes, and these bridges will affect a large number of people.
- The results should be treated as estimates of behavior.
- Considering the serious consequence of bridge collapse, future geophysical and structural investigation are in order to validate the results.
- Outcome of this research will better prepare the valley’s citizens and civil infrastructure for the threat of earthquakes and benefit its economic stability.