SUMMARY OF PRINCIPAL DISCUSSION RESULTS

Meeting of the Utah Liquefaction Advisory Group
February 27, 2004

(1) The project recommended by the group last year was funded by NEHRP, with the project starting November 1, 2003. Although receiving generally favorable review comments, one reviewer suggested that the proposal would have been stronger with a discussion comparing our proposed approach in Utah with California guidelines for analyzing liquefaction. Steve Bartlett indicated that this would be discussed in our next NEHRP proposal.

(2) A significant concern with the USGS is that we evaluate the uncertainty of our liquefaction analyses. This uncertainty is related to both the quality of data and the uncertainty of analytical techniques (for example, probabilistic ground accelerations used in the analyses). Bartlett discussed the three levels of "data quality indicators" used by geotechnical consultants. Techniques for evaluating uncertainty will be discussed by group members in the future and will be incorporated into current work and future proposals.

(3) Bartlett discussed the proposed liquefaction database structure, and the group discussed several items in more detail. The more significant include:

   (a) Hammer energy—Jim Higbee noted that UDOT maintains records of these values for local drill rigs and would be happy to share them for liquefaction studies.

   (b) Ground-water levels—The uncertainty of fluctuations in ground-water levels (both seasonal and long term) must be considered, and the liquefaction potential of granular layers that are now dry should be determined to account for fluctuations and perched ground water.

   (c) Data sources—A significant data source will be UDOT. However, better coverage is needed outside of transportation corridors. Salt Lake County has a geotechnical database of consultant studies, and Dave Simon volunteered to assist in obtaining geotechnical data from LDS Church investigations scattered throughout the county. We will also use the UGS database of shear-wave velocities, converting Vs-30 values in the database to Vs-15 values appropriate for liquefaction analyses.

   (d) Spatial variability—Higbee initiated discussion about how to handle spatial variability of data points and asked what criteria we would we use to select an appropriate value in a cluster of data points. This will be discussed in more detail by attendees in the future.

   (e) Liquefaction potential index—Les Youd mentioned the liquefaction potential index developed in Japanese studies as a tool to account for variations in the thickness of liquefiable layers, but he expressed doubts about its applicability.

(4) Bartlett discussed the earthquake scenario events to be used in the liquefaction analyses during the pilot project. There was a consensus that we should use earthquake ground shaking with a 2% exceedance probability in 50 years because it is the maximum considered earthquake in the IBC. The 10%-in-50-years event was also considered, but this may not be possible with the limited budget.

(5) For the probabilistic liquefaction analysis, Bartlett needs gridded points of earthquake magnitude and epicentral distance across the study area. Bartlett will talk to Mark Peterson (USGS) about deaggregation of USGS data to obtain the gridded points. Tim McCrink discussed an alternative technique used in California that weighted PGA according to its probability. Bartlett requested that Loren Anderson and others from Utah State University discuss this technique with McCrink.

(6) The meeting closed with discussion of possible NEHRP proposal topics for the next grant year. These topics include:

(a) Develop probabilistic methods to map the amount of liquefaction-induced ground deformation (lateral-spread displacement and liquefaction-induced settlement) in north Salt Lake County. These methods will use existing correlations that relate thickness of liquefiable layers and other soil factors to the potential for lateral spread displacement and settlement. Liquefaction-induced ground deformation will be mapped in the same area we selected for a pilot project to assess the probabilistic seismic hazard and funded by NEHRP in Federal FY 2004.

(b) Compile a liquefaction database of relevant geotechnical factors for south Salt Lake County. This database will be used in future years to assess the liquefaction hazard using the pilot-project methods in an adjacent area of similar, but not identical, geologic and geotechnical properties.

(c) Study documented occurrences of deformed Quaternary soils to determine if deformation is liquefaction-induced or related to other mechanisms (for example, failure of underlying clay). Also, attempt to determine the age of deformed soils to establish the liquefaction hazard posed by latest Pleistocene Lake Bonneville sands. Is the presence of these Pleistocene sands sufficient to indicate a high liquefaction hazard or, as suggested by criteria for liquefaction in California, does the Pleistocene age indicate a lower hazard?

Attendees

Members of the Utah Liquefaction Advisory Group:

Steve Bartlett, University of Utah (facilitator)
Clifton Farnsworth, UDOT
Travis Gerber, Brigham Young University
Dave Simon, Simon-Bymaster, Inc.
Barry Solomon, Utah Geological Survey

Les Youd, Brigham Young University

Additional attendees:

Jim Bay, Utah State University
Bruce Kaliser, consultant
Jim Higbee, UDOT
Tim McCrink, California Geological Survey
Jason Nielson, Kennecott
Michael Olsen, University of Utah