

Final Project Summary — PEER Lifelines Program

Project Title—ID Number	CPT Testing of Deposits in Imperial Valley—3D04		
Start/End Dates	5/1/03 – 3/31/04	Budget/ Funding Source	\$6,361 / Caltrans
Project Leader (boldface) and Other Team Members	Stewart (UCLA), Robb E.S. Moss (Fugro)		

1. Project goals and objectives

This project consisted of retesting of liquefaction and non-liquefaction field case histories in the Imperial Valley with the cone penetration test (CPT). The River Park and Heber Road sites were originally tested using a mechanical cone following the 1979 Imperial Valley Earthquake by Les Youd and co-workers. These two sites are rich in information because they have experienced several earthquakes in recent history, have been subjected to moderate levels of strong ground shaking, the liquefiable soils have appreciable fines content, and the sites contain a number of non-liquefied data points. The retesting was necessary because friction measurements from a modern electric cone are required to fully utilize these important case histories within liquefaction triggering databases.

2. Benefits of the results of this project to develop technologies and protocols to mitigate the vulnerability of electric systems and other lifelines to damage directly and indirectly caused by earthquakes. Also, benefits to develop assessment techniques to evaluate damage to electric systems caused by earthquakes and to assess fiscal impacts due to the loss of electric service to the community.

The data strengthens the database upon which probabilistic liquefaction triggering models are based. Such triggering models are important for incorporating ground failure phenomena into performance based design procedures.

3. Brief description of the accomplishments of the project

The electric cone data at the Heber Road and River Park sites is summarized in Figure 1. These important sites can now be incorporated into liquefaction case history databases and used in back-analysis of liquefaction triggering. The data points are overlaid on the world-wide liquefaction case history inventory in Figure 2.

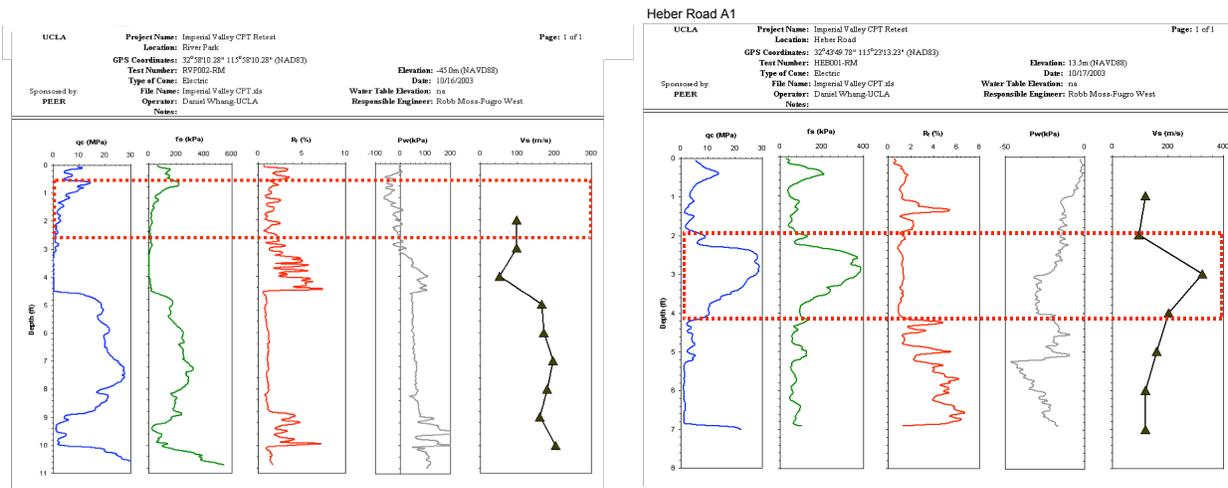


Fig. 1. Example CPT data from River park (left) and Heber Road (right) showing critical layers for liquefaction triggering

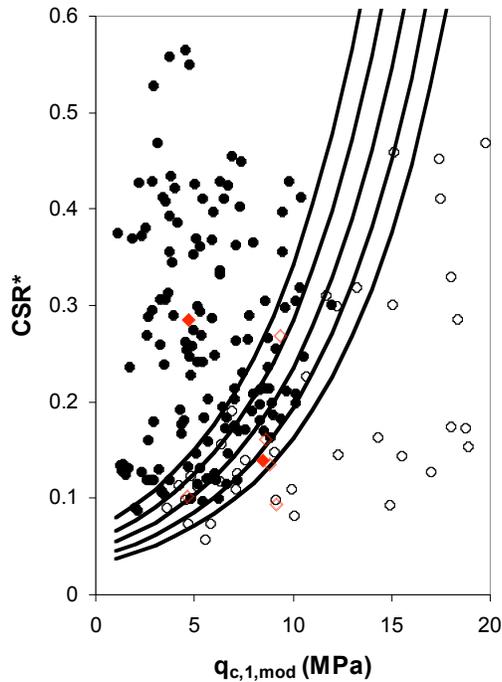


Fig. 2. New liquefaction/non-liquefaction case histories, corrected for friction ratio, shown with probabilistic liquefaction triggering curves and worldwide database developed by Moss & Seed (2004). Filled symbols are liquefaction data points and hollow symbols are non-liquefaction data points.

4. Describe any instances where you are aware that your results have been used in industry

None to report.

5. Methodology employed

Standard CPT testing procedures

6. Other related work conducted within and/or outside PEER

Liquefaction case history documentation and analysis by Bray and co-workers using Turkey data and Stewart and co-workers using Taiwan data.

7. Recommendations for the future work: what do you think should be done next?

Site reconnaissance and investigation programs should be continued after future major earthquakes.

8. Author(s), Title, and Date for the final report for this project

Moss, R.E.S., Collins, B.D., Whang, D.H., and Stewart, J.P. (2004). "Retesting of Liquefaction and Non-Liquefaction Case Histories in the Imperial Valley using CPT," Report to Pacific Engineering Research Center.