

Liquefaction Triggering & Consequence for Low-Plasticity Silty Soils

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Overview

Liquefaction Field Observations vs. Triggering Predictions

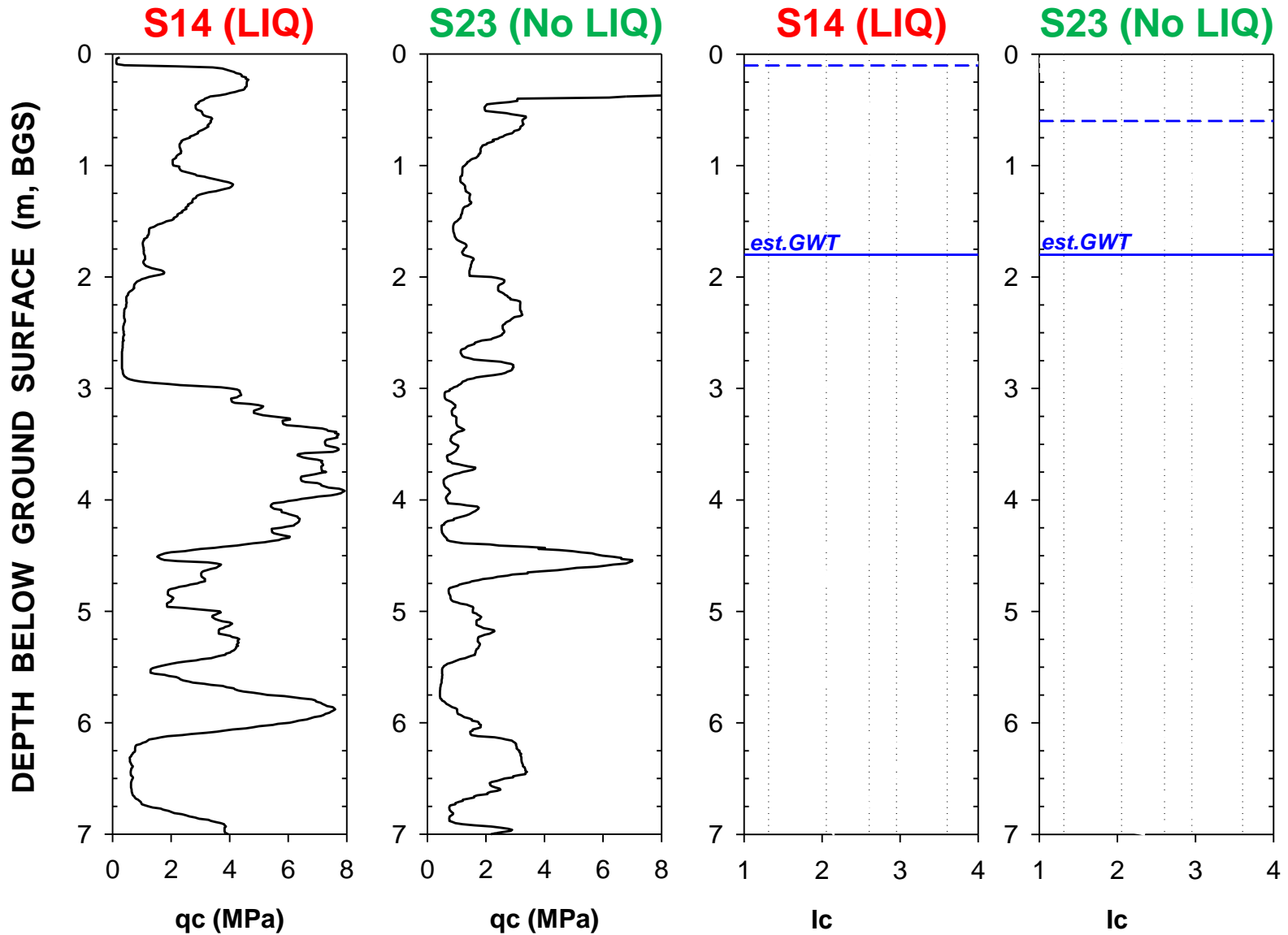


from GEER Report No. 27: Figure 4-5 (b)

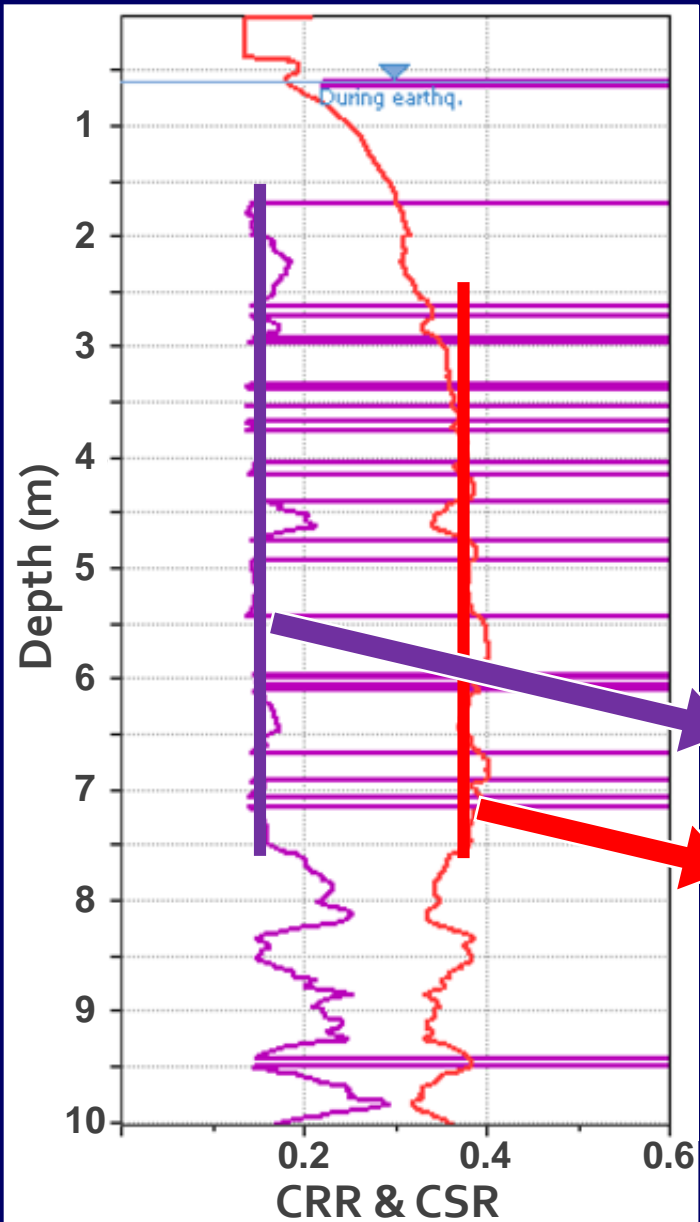
Research Goals

- Understand the discrepancy between state-of-practice triggering procedures and post-earthquake observations
- Sample and test silty soils in the laboratory to assess their seismic response and resistance
- Develop “non-liquefaction” case histories for integration in the global dataset
- Provide additional guidance on evaluating the seismic response of fine-grained soils for practicing engineers

Barrington Park vs. Riccarton Road



Liquefaction Assessment Comparison



Laboratory data vs. state-of-practice estimates and field observations

Riccarton Road Site

$$CRR_{TX,field} \sim 0.19$$

$$CRR_{B\&I} \sim 0.16$$

$$CSR_{B\&I} \sim 0.38$$

Boulanger & Idriss (2015) method selected for comparison

Other reasons for “over-prediction”?

- Groundwater table fluctuation & “clayey crust”
- Depositional environment (e.g, swamps)
- Highly stratified subsurface profile
- At-depth suppression of ejecta movement
- Angular particles/borderline soil types
- Inherent conservatism in analysis approach

Combination of all the above?

Scale of the problem → macro-scale system response
as opposed to element/specimen/particle level response

Going Forward

- Examination of other factors contributing to absence of liquefaction / observations at the ground surface
- Effective stress analysis
- Reconstituted specimen testing
- Site-specific and regional comparisons
 - Including clean sand sites
- Evaluation using larger dataset
 - Alternative FC correlations, I_c cut-off, and “clayey crust” thickness
- Development of a “best practices” document
- Integration of non-liquefaction case histories in global dataset (NGL)